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TM 11-847

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

RADIO TRANSMITTING SET AN/FRT

#7

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TM 11-847 is published for the use of all concerned.

BY ORDER OF THE SECRETARY OF THE ARMY:

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General, United States Army,
Chief of Staff.

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The Adjutant General.

INSTRUCTION BOOK
for
RADIO TRANSMITTING SET AN/FRT-22

WARNING

HIGH VOLTAGE

is used in the operation
of this equipment

DEATH ON CONTACT

may result if personnel fail to
observe safety precautions.

Be careful not to contact high-voltage connections or 115/230-volt input connections when working on or near this equipment. When working inside the equipment, after the power has been turned off, always short-circuit the high-voltage capacitors.

EXTREMELY DANGEROUS POTENTIALS

exist in the following units:

Radio Transmitter T-454/FRT-26
R-F Amplifier AM-738/FRT-22
Power Supply Assembly PP-1088/FRT-26
Power Supply Assembly PP-1089/FRT-22
Power Supply Control C-1402/FRT-22
Power Control C-598/FRT-6
Power Transformer TF-196/FRT-26
Power Transformer TF-197/FRT-22

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ARTIFICIAL RESPIRATION

GENERAL PRINCIPLES

1. Seconds count! Begin at once! Don't take time to move the victim unless you must. Don't loosen clothes, apply stimulants or try to warm the victim. Start resuscitation! Get air in the lungs! You may save a life!

2. Place the victim's body in a prone position, so that any fluids will drain from the respiratory passages. The head should be extended and turned sideward *never flexed forward;* the chin shouldn't sag, since obstruction of the respiratory passages may occur.

3. Remove any froth or debris from the mouth with your fingers. Draw the victim's tongue forward.

4. Begin artificial respiration. Continue it rhythmically and without any interruption until natural breathing starts or the victim is pronounced dead. Try to keep the rhythm smooth. Split-second timing is not absolutely essential.

5. When the victim starts breathing, or when additional help is available loosen the clothing; remove it, if it's wet; keep the victim warm. Shock should receive adequate attention. Don't interrupt the rhythmical artificial technique for these measures. Do them only when you have help or when natural breathing has started.

6. When the victim is breathing, adjust your timing to assist him. Don't fight his efforts to breathe. Synchronize your efforts with his. After resuscitation, keep him lying down until seen by a physician or until recovery seems certain.

7. Don't wait for mechanical resuscitation! If an approved model is available, use it, but, since mechanical resuscitators are only slightly more effective than properly performed "push-pull" manual technique, *never* delay manual resuscitation for it.

BACK-PRESSURE ARM LIFT METHOD

1. *Position of Victim.* Place the victim in the prone (face-down) position. Bend his elbows; place one hand upon the other. Turn his face to one side, placing his cheek upon his hands.

2. *Position of Operator.* Kneel on your left or right knee, at the victim's head, facing him. Your knee should be at the side of the victim's head close to his forearm, your foot should be near his elbow. Kneel on both knees if you find it more comfortable, with one knee on each side of the head. Place your hands on the flat of the victim's back so that their heels are just below the lower tip of his shoulder blades. With the tip of your thumbs touching spread your fingers downward and outward. (See A)

3. *Compression Phase.* Rock forward until your arms are approximately vertical and allow the weight of the upper part of your body to exert a slow, steady, even, downward pressure upon your hands. This forces air out of the lungs. Keep your elbows straight and press almost directly downward on the back. (See B)

4. *Expansion Phase.* Release the pressure, avoid any finish thrust, and commence to rock backward slowly. Place your arms upon the victim's arms just above the elbows, and draw his arms upward and toward you. Apply just enough lift to feel resistance and tension at the victim's shoulders.

Don't bend your elbows. As you rock backward, the victim's arms will be drawn toward you. (The arm lift expands the chest by pulling on the chest muscles, arching the back and relieving the weight on the chest.) Drop the arms gently to the ground or floor. This completes the cycle. (See C and D). Now. repeat the cycle.

5. *Cycle Timing and Rhythm.* Repeat the cycle 10 to 12 times per minute. Use a steady uniform rate of Press, Release, Lift, Release. Longer counts of about equal length should be given to the "Press" and "Lift" steps of the compression and expansion phases. Make the "Release" periods of minimum duration.

6. *Changing Position or Operator.*

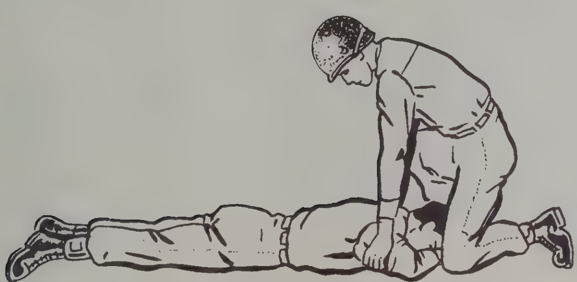
(*a*) Remember that you can use either or both knees or can shift knees during the procedure, provided you don't break the rhythm. Observe how you rock forward with the back-pressure and backward with the arm-lift. The rocking motion helps to sustain the rhythm and adds to the ease of operation.

(*b*) If you tire and another person is available, you can "take turns." Be careful not to break the rhythm in changing. Move to one side and let your replacement come in from the other side. Your replacement begins the "Press-Release" after one of the "Lift-Release" phases, as you move away.

TM AR-3

A **Position of operator and victim**

B **Compression phase**



C **Expansion phase (arm lift)**

D **Expansion phase (arm release)**

TM AR-4

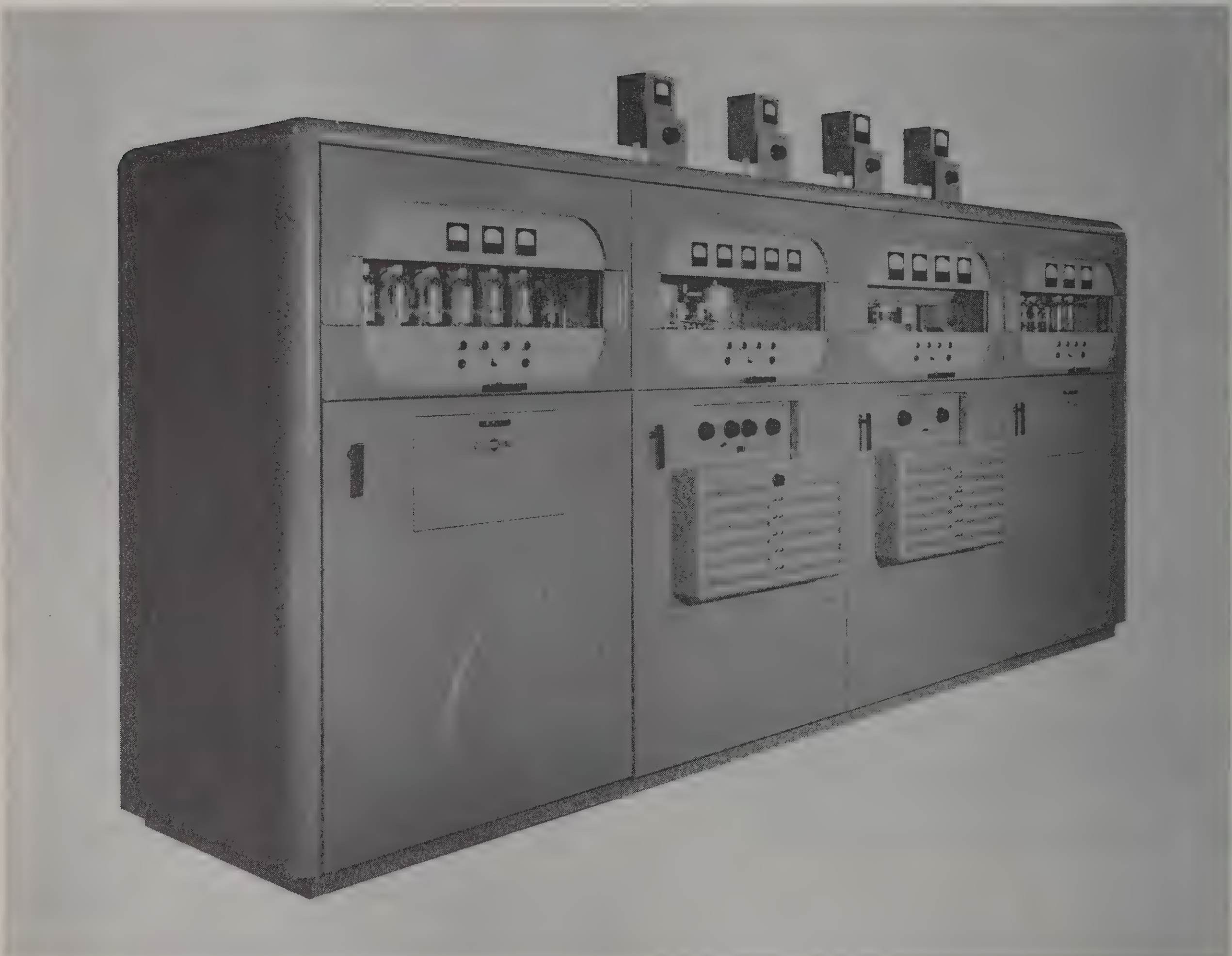


Figure 1. Radio Transmitting Set AN/FRT-22.

CHAPTER I

INTRODUCTION

Section I. GENERAL

1. Scope.

a. This instruction book contains directions for the installation, operation, maintenance, and repair of Radio Transmitting Set AN/FRT-22 (fig. 1). In addition to these instructions are two appendices, a list of references and an identification table of parts, respectively.

b. The nomenclature "AN/FRT-22" includes:

(1) Radio Transmitter T-454/FRT-26
(2) R-F Amplifier AM-738/FRT-22
(3) Power Supply Assembly PP-1088/FRT-26
(4) Power Supply Assembly PP-1089/FRT-22
(5) Power Supply PP-454/FRT-5
(6) Power Supply Control C-1402/FRT-26
(7) Power Control C-598/FRT-6
(8) Power Transformer TF-196/FRT-26
(9) Power Transformer TF-197/FRT-22
(10) R-F Oscillator O-91/FRT-5
(11) R-F Oscillator O-270/FRT-26
(12) Frequency-Shift Keyer KY-45/FRT-5

2. Forms and Records.

The following forms will be used for reporting unsatisfactory conditions of Army material and equipment.

a. DD Form 6, Report of Damage or Improper Shipment, will be filled out and forwarded as prescribed in SR-745-45-5.

b. DA AGO Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR-700-45-5.

c. DA AGO Form 11-238, Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form.

d. DA AGO Form 11-239, Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form.

e. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Purpose and Use.

a. Description. Radio Transmitting Set AN/FRT-22 (fig. 1) is a high-power radiotelegraph communications transmitter. Its operation is based upon the principle of generating, at an exact sub-multiple of the desired output frequency, a low-energy r-f (radio-frequency) signal, and multiplying the frequency and amplifying the power of this signal to produce the desired r-f carrier. This carrier is then interrupted, or the frequency is shifted, in accordance with the intelligence to be transmitted. The resultant r-f energy is then radiated from a suitable antenna.

b. Major Units. As shown in fig. 1, the equipment consists of the transmitter proper, which is contained in four metal cabinets bolted together to form a single unit; two high-voltage plate transformers; and two power control units. Each of the latter four units is housed in a metal enclosure.

c. Purpose. Radio Transmitting Set AN/FRT-22 is intended for use as fixed radio station equipment. The principal function of the equipment is to effect communication with reliability and precision from point to point. Because of its high r-f power output, the transmitter is intended primarily as a means of transmitting intelligence over long distances.

d. Capabilities. The transmitter is capable of providing an output of 40 kilowatts of c-w (continuous-wave) radiotelegraph, frequency-shift telegraphy,

or facsimile transmission on any frequency from 4.0 to 26.5 megacycles.

4. Technical Characteristics.

Frequency range	4.0 mc to 26.5 mc
Transmitter type	MOPA (Master oscillator power amplifier)
Crystal type	Type AN/CR-27/U with fundamental frequency between 2.0 and 4.2 mc (not supplied by contractor)
Types of emission	C-w (on-off) or fs (frequency-shift) keying, or SSB (single sideband) when used with an SSB exciter
Keying speed	Up to 400 words per minute CW, or 240 dot-cycles per second fsk.
Number of tubes	123
No. of preset frequency channels	Ten
Ambient humidity	up to 95%
Ambient temperature	32F to 122F

Power source requirements:

Voltage	230 ±10%
Frequency	50/60 cps
Number of phases	3

Input power:

Filaments on	11.2 kw
High voltage on Key up	15.6 kw
Key down, 50 kw output	84.5 kw

Power factor of equipment:

Starting (high voltage off)	82%
Standby (key open)	80.5%
Normal operation	96%

Nominal carrier power output for each type of emission:

On-off keying	40 kw into 600-ohm load with max swr (standing wave ratio) of 2 to 1
FSK	40 kw into 600-ohm load with max swr of 2 to 1
SSB	30 kw peak envelope power
Antenna	Balanced 600-ohm

5. Table of Components.

Name of unit	Designation	Required No.	Overall dimensions Height (in.)	Width (in.)	Depth (in.)	Volume (cu.ft)	Approx. Unit Weight (lb)
Radio Transmitter	T-454/FRT-26	1	91-9/16	43-1/2	42-7/16	97.1	2200
Power Supply Assembly	PP-1088/FRT-26	1	79-5/16	43-1/2*	37-11/16	75.2	1800
R-F Oscillator	O-270/FRT-26	1	5-1/4	19	12-7/8	0.743	15
R-F Oscillator	O-91/FRT-5	1	10-1/2	19	15-1/8	1.75	35
Freq. Shift Keyer	KY-45/FRT-5	1	10-1/2	19	15-1/8	1.75	29
Power Supply	PP-454/FRT-5	1	8-3/4	19	15-1/8	1.45	88
Power Transformer	TF-196/FRT-26	1	32	42	19-1/8	14.8	605
Power Supply Control	C-1402/FRT-26	1	38-1/4	30-1/4	14-3/4	9.87	298
R-F Amplifier	AM-738/FRT-22	1	91-9/16	43-1/2	59-7/16	137	2650
Power Supply Assembly	PP-1089/FRT-22	1	79-5/16	43-1/2*	37-11/16	75.2	2000
Power Transformer	TF-197/FRT-22	1	60	57	30-1/2	60.3	2700
Power Control	C-598/FRT-6	1	24-1/4	30-1/4	14-3/4	6.26	175
Auxiliary Equipment, Spares, etc. (See Parts List)							
Total		12				481.423	12595

*Not including dust cover

Note. This list is for general information only. See appropriate supply publications for information pertaining to requisition of spare parts.

6. Description of Major and Minor Units Comprising Radio Transmitting Set AN/FRT-22.

a. List of Units. Radio Transmitting Set AN/FRT-22 consists of the following major and minor units:

(1) Radio Transmitter T-454/FRT-26, which contains:

(a) R-F Oscillator O-91/FRT-5.
(b) R-F Oscillator O-270/FRT-26.
(c) Frequency Shift Keyer KY-45/FRT-5.
(d) Power Supply PP-454/FRT-5.
(e) Servo amplifiers.
(f) Servo power supply.
(g) Patch panel.
(h) Electronic keyer.
(i) Upper and lower front door control panels.
(j) Buffer amplifier, frequency multipliers, and driver amplifier.
(k) Intermediate power amplifier.
(l) Coupling network.

(2) R-F Amplifier AM-738/FRT-22, which contains:

(a) Servo amplifiers.
(b) Servo power supply.
(c) Upper and lower front door control panels.
(d) Power Amplifier.
(e) Antenna Coupling network.

(3) Power Supply Assembly PP-1088/FRT-26, which contains:

(a) Control circuits.
(b) Low voltage supply.
(c) High voltage supply.
(d) Bias voltage supply.
(e) Primary voltage regulator.

(4) Power Supply Assembly PP-1089/FRT-22, contains:

(a) Control circuits.
(b) High voltage supply.
(c) Bias supply.

(5) Power Supply Control C-1402/FRT-26.
(6) Power Control C-598/FRT-6.
(7) Power Transformer TF-196/FRT-26.
(8) Power Transformer TF-197/FRT-22.

b. Major and Minor Units, Details. In more detail, the major and minor units of Radio Transmitting Set AN/FRT-22 are:

(1) *Radio Transmitter T-454/FRT-26 (fig. 1).* This unit occupies the left center bay of the four main bays. The upper front door of Radio Transmitter T-454/FRT-26 has a large glass window to provide continuous visibility of the intermediate power amplifiers. All meters directly associated with tuning or adjusting the r-f stages in the bay are mounted above the window. The d-c controls and colored status lamps are located below the window on the upper front door. A ventilating blower cooling the intermediate power amplifier tubes is located on the floor of the unit. Dual interlocks for personnel protection are incorporated on all doors but the lower front door. Radio Transmitter T-454/FRT-26 contains, in a special mounting space, the subordinate units described below in paragraphs (a), (b), (c), (d), (e), (f), and (g). This space is a double width, 25 inch high standard equipment rack. This rack is pivoted, providing access to the rear of all the units mounted theron. Radio Transmitter T-454/FRT-26 contains as permanent equipment the circuits and units described under paragraphs (h), (i), (j), (k), and (l).

(a) *R-F Oscillator O-91/FRT-5 (fig. 2).* This oscillator is a stabilized variable frequency oscillator which derives its stability from a 100-kc crystal standard. Utilizing a precision permeability-tuned oscillator, it provides a frequency-stabilized output in the range 2 to 4.5 mc. It is mounted in the equipment rack which occupies the lower part of the r-f bay. Refer to paragraph 5 for dimensions.

(b) *R-F Oscillator O-270/FRT-26 (fig. 3).* This oscillator is a crystal-controlled 10-channel oscillator. With proper crystals, the oscillator provides an output of 2 - 4.3 mc. Plate and filament voltages for this unit are derived from the main transmitter. The oscillator is mounted in the equipment rack of the r-f bay. Refer to paragraph 5 for dimensions.

(c) *Frequency Shift Keyer KY-45/FRT-5 (fig. 4).* This keyer is used to provide a frequency shift which is linear with respect to the keying voltage. In a telegraph system, it causes the transmitter to emit one frequency for a mark signal and another for a space signal. Because of its linearity with respect to the keying voltage or current, it may also be used for photo and teleprinter transmission. This unit is mounted in the equipment rack of the r-f bay. Refer to paragraph 5 for dimensions.

(d) *Power Supply PP-454/FRT-5 (fig. 5).* This is a dual power supply furnishing plate and filament voltages to R-F Oscillator O-91/FRT-5 and Frequency Shift Keyer KY-45/FRT-5. It also supplies a regulated bias to the keyer. It is mounted in the equipment rack of the r-f bay. Refer to paragraph 5 for dimensions.

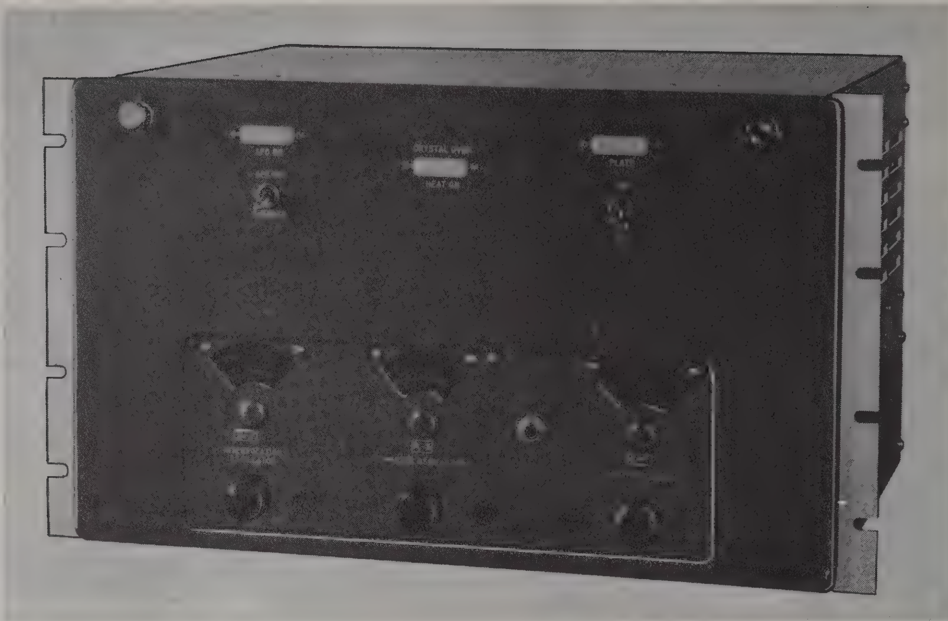


Figure 2. Stabilized Master Oscillator O-91/FRT-5.

(e) *Servo amplifiers (figs. 6 and 7).* Six identical plug-in servo-control amplifiers are mounted in a common enclosure on the equipment rack in the r-f bay. One of these units is associated with each of the six sero-positioned tuned circuits in Radio Transmitter T-454/FRT-26. Each contains a voltage amplifier, a relay-control tube, and a pair of motor-control relays.

(f) *Servo power supply (fig. 8).* This power supply furnishes voltage to all of the servo amplifiers and drive motors located in Radio Transmitter T-454/FRT-26. It is mounted on the lower left side of the equipment rack, immediately below the servo amplifier unit.

(g) *Patch panel.* The remaining unit in the equipment rack is the patch panel, which contains the two oscillator output jacks, the keyer input and output jacks, the transmitter input jack and several spare jacks. Three cables with connectors on each end

Figure 3. R-F Oscillator O-270/FRT-26.

Figure 4. Frequency Shift Keyer KY-45/FRT-5.

are supplied with the unit to facilitate setting up any desired type of excitation and keying.

(h) *Electronic keyer.* This keyer is mounted on the right side of the control panel of Radio Transmitter T-454/FRT-26. It receives the keying impulses and accomplishes off-on keying of the transmitter proper. Provision has been made for keying the transmitter by negative, positive, polar negative, or polar positive impulses for mark.

(i) *Control panels.* Three control areas are located on the front of the Radio Transmitter T-454/FRT-26. The upper front door mounts the filament and plate on-off controls. Located on a control panel accessible through an opening in the lower front door are two meter switches, the keyer controls, the r-f excitation control, and the excitation selector control. The preset tuning control panel, mounted on the lower front door, contains the intermediate power amplifier tuning controls.

Figure 5. Power Supply PP-454/FRT-5.

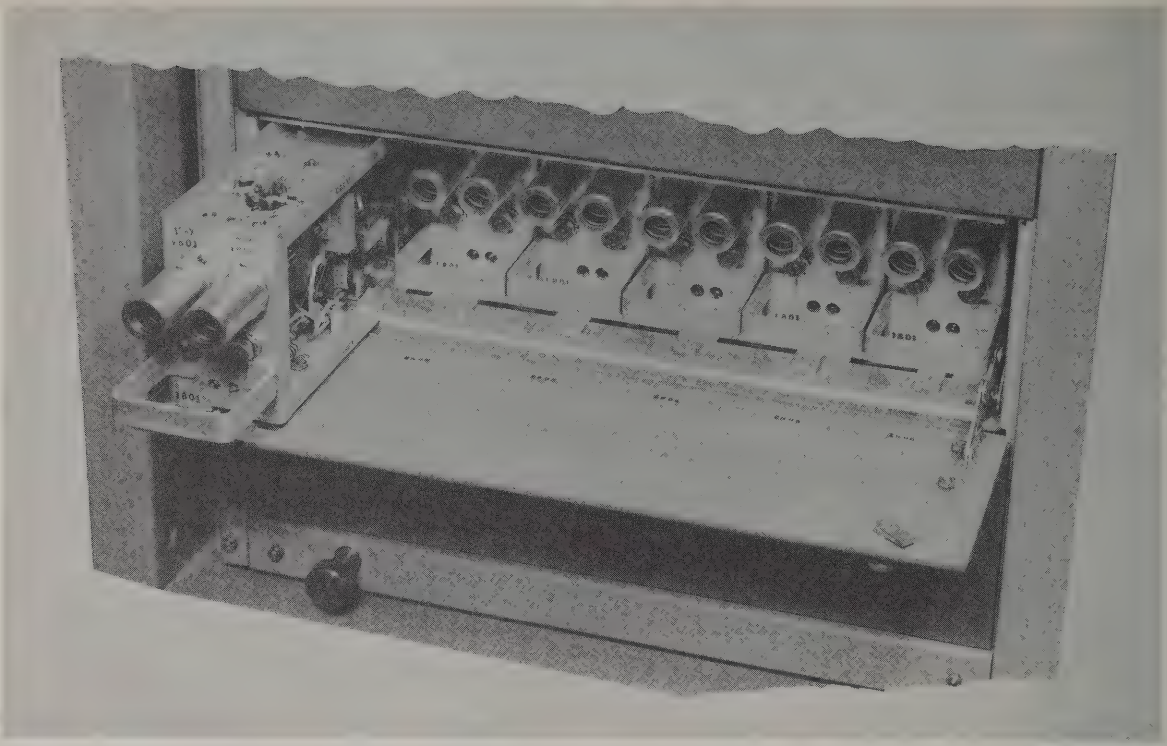


Figure 6. Servo Amplifiers, IPA Bay.

(j) *Buffer amplifier, frequency multipliers, driver amplifiers.* The buffer amplifier and frequency multipliers are contained within a sub-assembly which is mounted to the left of the control panel. The unit is hinged so that it may be tilted forward for easy access to the interior. Inside are located a broad-band buffer amplifier and two frequency-multiplier stages. The driver tube is mounted on top of the assembly.

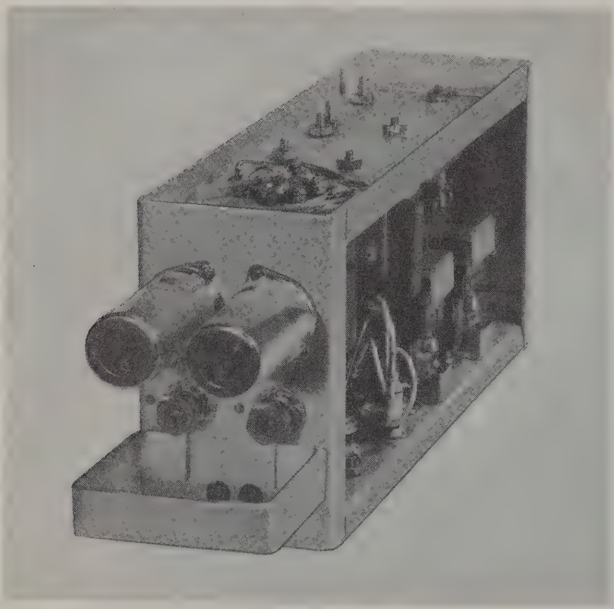


Figure 7. Servo Amplifier.

(k) *Intermediate power amplifier.* The intermediate power amplifier is located on the top deck of Radio Transmitter T-454/FRT-26. It is a push-pull, cross-neutralized, grounded-cathode amplifier with both grid and plate circuits resonant and continuously variable from 4.0 to 26.0 mc. The resonant grid circuit, which also provides the plate tank for the driver stage, is contained within an enclosure located behind the control panel. The power amplifier tube sockets are mounted on top of this enclosure. Cooling air for the PA tubes is forced into this enclosure by the blower, located in the lower rear of the cabinet, and upward through the tube sockets to cool the tube radiators. The resonant plate tank circuit is located directly behind the intermediate power amplifier tubes and is accessible through the large double rear doors.

(l) *Coupling network.* The coupling network occupies the top of Radio Transmitter T-454/FRT-26. It is a resonant circuit

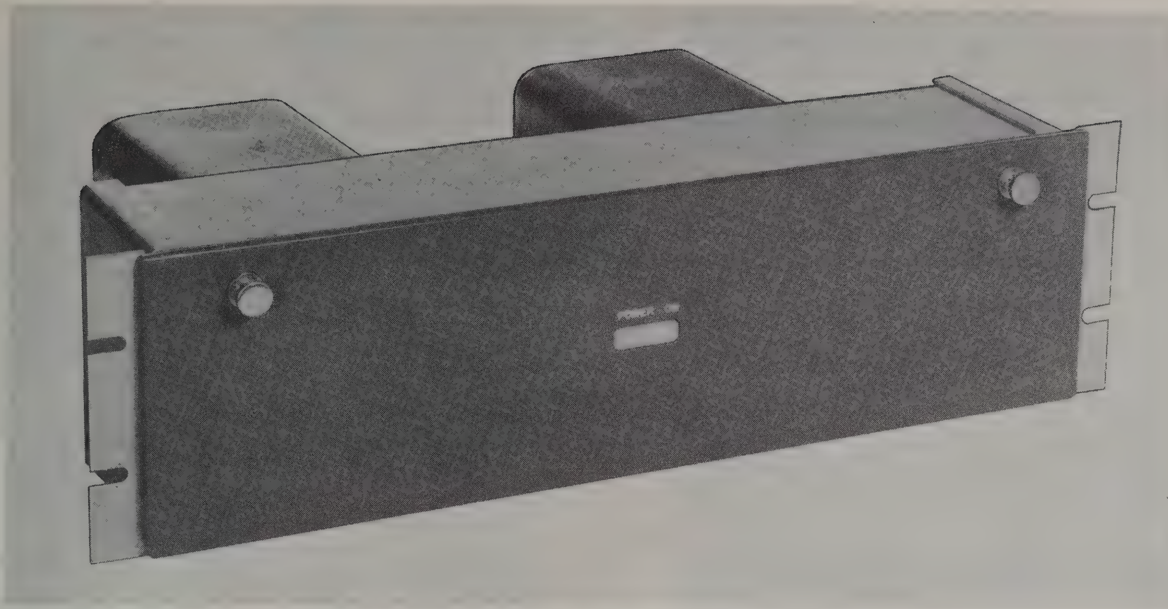


Figure 8. Servo Power Supply.

continuously variable across the entire frequency range and is suspended as a unit on rails, or tracks, from the top of the cabinet. Magnetic coupling from the plate tank coils to the inductors of this coupling network is varied by positioning the coupler on its rails. Further adjustment is accomplished by a three-position control switch on the preset tuning control panel. This adjustment is for purposes of balancing the coupling network over the frequency range of the unit. The three-position switch provides one open position, one in which one capacitor is short-circuited, and one in which the same capacitor is short-circuited and grounded.

(2) *R-F Amplifier AM-738/FRT-22.* This unit occupies the entire right-center bay of Radio Transmitting Set AN/FRT-22. A large glass window in the upper front door of R-F Amplifier AM-738/FRT-22 provides continuous visibility of the power amplifier tubes. Meters directly associated with tuning or adjusting the r-f stages in the bay are mounted above the window; d-c voltage controls and colored status lights are mounted below the window. On the floor of the bay, accessible through the rear doors, is the blower, which provides forced-draft ventilation for the power amplifiers. All doors except the lower front door have dual interlocks to afford adequate protection for the operating and maintenance personnel. In addition R-F Amplifier AM-738/FRT-22 contains the following subordinate units and circuits.

(a) *Power amplifier.*

1. The power amplifier is located on the top deck of R-F Amplifier AM-738/FRT-22. It consists of six forced-air cooled triode tubes operating in a push-pull grounded-grid circuit. Three tubes identical to those used in the intermediate power amplifier are mounted in a special common socket, and are operated in parallel on each side of the push-pull circuit. No neutralization is necessary because of the inherent isolation between the input and output circuits of the grounded grid amplifier. The cathode tank circuit of the power amplifiers is an extension of the output coupling circuit of the intermediate power amplifier, and is located in Radio Transmitter T-454/FRT-26.

2. Special r-f chokes are inserted in the filament lead to prevent short-circuiting the input circuit. These chokes and a variable input capacitor are located in the enclosure directly above the power amplifier tubes. This enclosure will be referred to as the cathode box, or cathode enclosure throughout this book. A pair of special grid contact and bypassing assemblies are fastened to the bottom surface of the cathode box.

3. Anode, grid, and filament connections are so arranged that the tubes can be inserted as plug-in units from the bot-

tom of the plate casting. The platform holding the tubes can be raised or lowered by a handwheel-operated elevator. Cooling air for the tubes is forced upward through these elevators from the air chamber upon which they are mounted. A blower is located on the floor at the rear of the cabinet. The plate tank and output coupling circuits occupy the upper half of the rear portion of the cabinet. The plate tank circuit consists of two oppositely-wound variable inductors and two variable vacuum capacitors all mounted with their axes vertical. These four variable elements are driven simultaneously by a motor-driven chain-and-sprocket arrangement located on the shelf below the tank circuit.

(b) *Antenna coupling network.* The output network consists of a similar pair of variable coils and a single variable vacuum capacitor varied simultaneously by a tuning motor. The network is suspended as a unit on rails from the top of the cabinet and is moved forward or backward to vary the coupling to the plate tank coils.

(c) *Control panels.* Three control areas are located on the front of R-F Amplifier AM-738/FRT-22. The upper front door mounts the filament and plate on-off controls. Located on a control panel accessible through an opening in the lower front door are two meter switches. The preset tuning control panel, mounted on the lower front door, contains the power amplifier tuning controls.

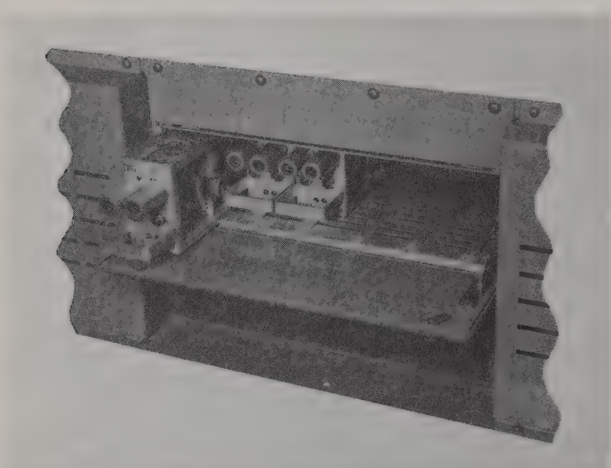


Figure 9. Servo Amplifiers, PA Bay.

(d) *Servo amplifiers (figs. 7 and 9).* Three identical servo amplifiers are mounted in an assembly rack in the center of the lower part of R-F Amplifier AM-738/FRT-22. The servo amplifiers, in conjunction with their tuning motors, serve to position the three tuned circuits in this bay, PA PLATE TUNING, ANTENNA LOADING, ANTENNA TUNING.

(e) *Servo power supply (fig. 7).* The servo power supply furnishes voltage to the three servo amplifiers located in R-F Amplifier AM-738/FRT-22. It is mounted at the bottom center of the assembly rack in the r-f bay.

(3) *Power Supply Assembly PP-1088/FRT-26.* This unit occupies the left-hand bay of Radio Transmitting Set AN/FRT-22. Continuous visibility of the rectifier tubes is provided by a large window in the upper front door. Meters associated with the high voltage d-c, the primary a-c voltage and the intermediate power amplifier filaments are located above the window. Status lights and controls are mounted below the window. A blower for circulating air in the power bay is mounted on the floor of the unit and is accessible through the rear doors. No special cooling is required for the rectifiers, since they contain the inert gas xenon, and can operate efficiently and properly in spite of extremely wide temperature variations. All doors except the lower front are provided with dual interlocks for the protection of personnel. In addition Power Supply Assembly PP-1088/FRT-26 contains the following subordinate units and circuits.

(a) *Control circuits.* A vertical panel inside the lower front door of Power Supply Assembly PP-1088/FRT-26 mounts all control and overload relays and the timers associated with both the power supply and Radio Transmitter T-454/FRT-26. The control circuits are also interlocked with those of the remaining two bays to afford adequate protection to personnel. The lower front door is not interlocked and may be opened at any time without exposing open or unprotected circuits. A small panel on this door provides convenient access to the controls most often used in connection with Power Supply Assembly PP-1088/FRT-26 and Radio Transmitter T-454/FRT-26.

(b) *Low-voltage supply.* Six hundred volts d-c positive to ground, for operation of the frequency multiplier and buffer stages, the driver screen, and R-F Oscillator O-270/FRT-26, is provided by a common low-voltage supply. Two xenon-filled 3B28 rectifier tubes for this supply are

located at the end of the rectifier shelf in Power Supply Assembly PP-1088/FRT-26.

(c) *Bias supply.* Four hundred volts d-c negative to ground for biasing the frequency multipliers, driver, intermediate power amplifier, and off-on keyer, is provided by a supply located in Power Supply Assembly PP-1088/FRT-26. Two 3B28 rectifier tubes are used in this supply.

(d) *High voltage supply.* Six 4B32 rectifier tubes mounted on the tube shelf are part of the plate voltage supply for the intermediate power amplifiers. The high-voltage transformer for this supply is external to the unit. Filter components are located on the floor of the bay and are readily accessible through the large double rear doors.

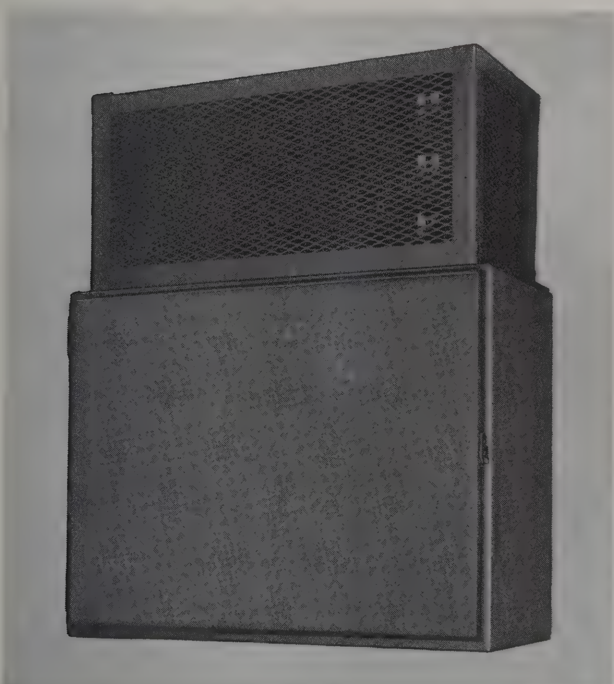


Figure 10. Power Supply Control C-1402/FRT-26.

(e) *Primary voltage regulator.* The primary voltage regulating system consists of a set of buck-boost transformers in series with the 230-volt input line, a motor-driven powerstat, and a voltage-sensitive motor-control circuit. The voltage regulating system maintains a constant output voltage of 230 over a line frequency range of 50-60 cps and an input voltage variation of ±10%. The regulated voltage is distributed to all primary circuits of the transmitter except the high-voltage plate transformers. All components of the voltage-regulating system are located in power bay PP-1088/FRT-26. The buck-boost transformers are located underneath the blower, the powerstat is mounted on the floor of the cabinet next to the blower, and the motor-control circuit components are mounted on a sub-panel behind the control panel of the power unit.

(4) *Power Supply Assembly PP-1089/FRT-22.* The right-hand bay of Radio Transmitting Set AN/FRT-22 is designated Power Supply Assembly PP-1089/FRT-22. The rectifier tubes are in constant view through the large glass window in the upper front door of the bay. Meters and controls for the unit are mounted above and below the window, respectively. A blower to provide proper circulation of the aid is mounted on the floor of Power Supply Assembly PP-1089/FRT-22, and is accessible through the rear doors. No special cooling is required for the xenon-filled tubes. Dual interlocks, both automatic mechanical and positive electrical, are incorporated on all doors but the lower front door to provide adequate protection to personnel. In addition, Power Supply Assembly PP-1089/FRT-22 contains the following subordinate units and circuits.

(a) *Control circuits.* A vertical panel behind the lower front door mounts the control and overload relays and the timers which are associated with both Power Supply Assembly PP-1089/FRT-22 and R-F Amplifier AM-738/FRT-22. These are, as mentioned previously, interlocked with those of the other two bays. The lower front door is not interlocked, and may be opened at any time without exposing unguarded circuits.

(b) *High voltage supply.* Twelve xenon gas-filled 4B32 rectifier tubes are used in the high-voltage supply which furnishes plate voltage to the power amplifier stage. The tubes are mounted on the top deck of Power Supply Assembly PP-1089/FRT-22 and are readily accessible through the upper front door. The high-voltage filter components are mounted on the floor of the bay and are accessible through the rear doors. The high-voltage supply transformer is external to Power Supply Assembly PP-1089/FRT-22.

(c) *Bias supply.* Four 3B28 rectifier tubes are used as the rectifiers of a high-current, low-voltage (1.5 amp at 400 v) bias supply for the power amplifiers. All of the components for this supply are located within the cabinet.

(5) *Power Supply Control C-1402/FRT-26 (fig. 10).* This power control includes the primary line input terminals for the 230-volt a-c power to all parts of the transmitter except the final power amplifier high-voltage power supply plate-transformer primary. The following components are included: a fused 3-phase circuit to the transmitter for filaments, blowers, etc.; a combination overload breaker and start-stop contactor; a delta-wye switch for the intermediate power amplifier plate-transformer primary, and a set of series line resistors for tune-up purposes with a shorting contactor for normal operation. These components are housed in a heavy-gauge sheet-metal box with a large front door. This box is stamped with knock-out discs for conduit wiring. The box is provided with four large mounting holes in the rear corners so that it may be wall mounted and connected directly to the primary line bus by means of rigid conduit.

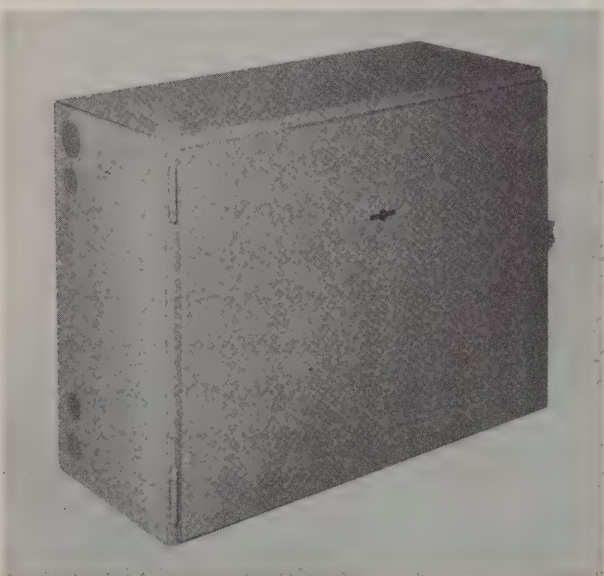


Figure 11. Power Control C-598/FRT-6.

(6) *Power Control C-598/FRT-6 (fig. 11).* This power control consists of the primary-line combination overload breaker and start-stop contactor mounted in a heavy-gauge sheet-metal enclosure. This enclosure is identical to the one which houses Power Supply Control C-1402/FRT-26 except that it does not have the ventilated resistor cage mounted on top. It is designed to be mounted on the wall near the main plate transformer with rigid, conduit-type wiring.

(7) *Power Transformer TF-196/FRT-26 (fig. 12).* This power transformer is an external unit to be mounted on the floor, separate from the cabinets. It is a three-phase, dry-type, air-cooled unit enclosed in a ventilated sheet-metal case. It supplies the high voltage for the intermediate power amplifier plate-voltage supply.

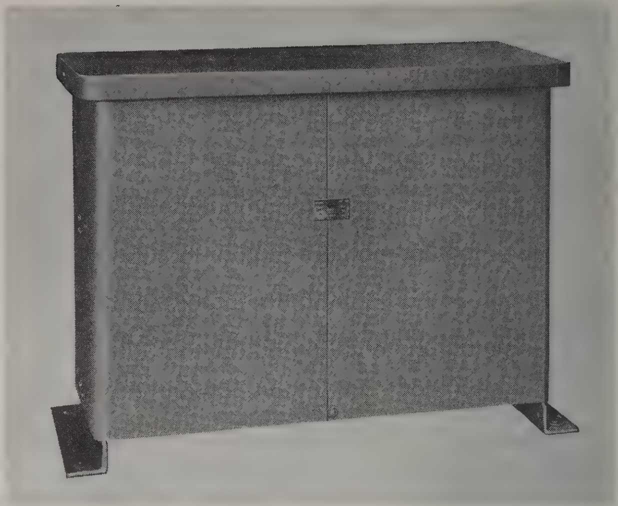


Figure 12. Power Transformer TF-196/FRT-26.

(8) *Power Transformer TF-197/FRT-22 (fig. 13).* This power transformer is an external unit to be mounted on the floor, apart from the cabinets. It is the main plate transformer of the power amplifier high-voltage supply. This transformer is a three-phase dry-type air-cooled unit enclosed in a ventilated

Figure 13. Power Transformer TF-197/FRT-22.

grounded metal case. It contains a fixed transformer and a motor-operated variable transformer which can be used to raise or lower the output voltage from 40 percent below to 10 percent above the nominal value.

7. Running Spares.

Spares are provided for normally expendable items such as tubes, pilot lamps, and fuses. The spare parts are listed in Appendix II.

8. Additional Equipment Required.

The only additional equipment required for operation of Radio Transmitting Set AN/FRT-22 is a complement of crystals, type CR-27/U, with fundamental frequencies between 2 and 4.3 mc. It is assumed that the station installation includes 230-volt and 115-volt power outlets, a source of keying information, a suitable antenna, etc.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE ON RECEIPT OF RADIO TRANSMITTING SET AN/FRT-22

9. Siting

a. External Requirements. Radio Transmitting Set AN/FRT-22 is a fixed station radio equipment of large power, weight and size. Therefore, it is assumed that external requirements of siting, including characteristics of terrain and drainage, location of antenna and nearby structures, type of housing available, and need of easy access, will have been met before equipment is received.

b. Interior Requirements. The shelter for the equipment must meet the following requirements:

(1) The floor must be capable of sustaining the weight of the equipment in a level position without vibration. Wiring trenches should be provided.

(2) Sufficient space must be available for repair work and for door swing. Provide space on at least one side of the equipment so that it is possible to walk to the rear of the transmitter, where external power controls and transformers will normally be located. Provide space at the rear of the transmitter as specified in subparagraph (6) below. Within the limitations given in this section, the transmitter may be located anywhere convenient to the transmission lines and external power connections.

(3) The ceiling must be high enough to allow for r-f transmission line installation.

(4) Adequate ventilation must be available.

(5) Adequate lighting for day and night operation must be provided. Position lighting fixtures so that panel designations may be read easily by operating personnel. Portable drop lamps and extension cords are useful to operating and maintenance personnel.

(6) Refer to figure 15 for a typical installation. To use this arrangement, mount Power Supply Control C-1402/FRT-26 and Power Control C-598/FRT-6 on the wall with Power Transformer TF-196/FRT-26 and Power Transformer TF-197/FRT-22 directly below or near their respective power-control boxes. Leave a 6-inch clearance between the transformers and the wall for ventilating purposes. Mount one of the red high voltage warning lamps on the wall above the Power Controls, the other on the ceiling above the transmitter. Set the transmitter 6-1/2 feet in front of the wall that mounts the power control boxes. Run interconnecting conduit and wires in a trench. Wire for most of these connections is included with the equipment. If the installation arrangement deviates from the typical arrangement shown, it may be necessary to procure additional wire and conduit.

10. Uncrating, Unpacking and Checking New Equipment

Note. For used or reconditioned equipment, refer to paragraph 13.

a. General. Equipment may be shipped in overseas packing cases or in domestic packing cases. When new equipment is received, select a location where the equipment may be unpacked without exposure to the elements and which is convenient to the permanent or semi-permanent installation of the equipment.

b. Step-by-step Instructions for Uncrating and Unpacking. The entire equipment, including spare parts, is packed in wooden cases. The four large cabinets are individually crated. All units have been carefully braced in the crates to prevent damage due to shifting during shipment. Each of the four large units was crated by placing the unit upright on a wooden base and securing the unit to the base with metal straps passed over the top of the unit and bolted to the wooden base at each end. The wooden base is bolted to the bottom of the packing case and the rest of the packing case is built around the unit. It will be necessary to use a hoist or considerable manpower to move the cases into position on the transmitting room floor. In unpacking the equip-

ment, the general procedures and precautions outlined below apply:

(1) Place the packing case near the position in which the equipment is to be installed.

(2) Cut and remove the steel straps used to reinforce the corners of the packing case.

(3) Remove the nails with a nail puller.

(4) Remove the sides and top of the packing case.

Caution: Prying off the sides or top may result in damage to the equipment.

(5) Remove the bags of dessicant which have been distributed throughout the transmitter for moisture absorption.

(6) Many of the components within the large cabinets have been blocked in place with wooden supports. In some cases padding has been used to protect the equipment. Remove all excess material. Untie all components that have been bound with tape.

(7) Move the cabinet into position on the floor.

Caution: Use extreme care when moving the equipment to avoid damage to the cabinets or components.

(8) Carefully remove the smaller units from their packing cases, but do not install them until they have been thoroughly checked.

(9) While inspecting the equipment visually for damage, check all the units and components received against the master packing slip.

Note. Save the original packing cases and containers for both export and domestic shipments. They can be used again when the equipment is repacked for storage or shipment.

11. Installation of Components Removed Prior to Shipment

a. Power Supply Assembly PP-1088/FRT-26 (figs. 215 through 218). Components removed prior to shipment include the following; perform the steps indicated to install them:

(1) *Tubes.* Return to proper sockets as indicated by type designations on chassis.

(2) *Resistors (ferrule type).* Refer to the parts list, using the symbol stamped on the cabinet, the JAN number in the parts list, and the JAN number on the resistor to determine the correct location.

(3) *High voltage filter choke L-301 (fig. 217).* This choke mounts on the floor of the power supply cabinet. Wires that connect to the choke are clearly marked to indicate the point of connection.

b. Radio Transmitter T-454/FRT-26 (figs. 183 through 188). Components removed prior to shipment include the following: perform the steps indicated to install them:

(1) *Tubes.* Return to proper sockets as indicated by type designations on chassis.

(2) *Resistors (ferrule type).* Refer to the parts list and use the symbol stamped on the cabinet, the JAN number in the parts list, and the JAN number on the resistor to determine the correct location.

(3) *Vacuum capacitors.* Refer to the parts list, using the symbol stamped on the cabinet, the JAN number in the parts list, and the JAN number on the capacitor to determine the correct location.

(4) *Transmission line feed-thru bowls, E-661.* Remount in the roof of the unit in the holes provided.

(5) *Antenna Meters.* Install on the roof of the unit. Holes for mounting are provided.

(6) *IPA filament transformers T-505 and T-506 (fig. 186).* These transformers mount in the bottom of Radio Transmitter T-454/FRT-26. Wires connecting to these filament transformers are clearly marked to indicate the correct connections.

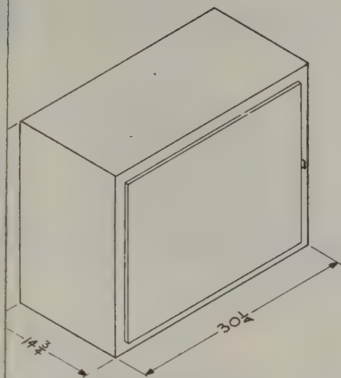
(7) *Coupling network.*

Note. The procedure outlined below should be followed carefully or trouble will be encountered during installation.

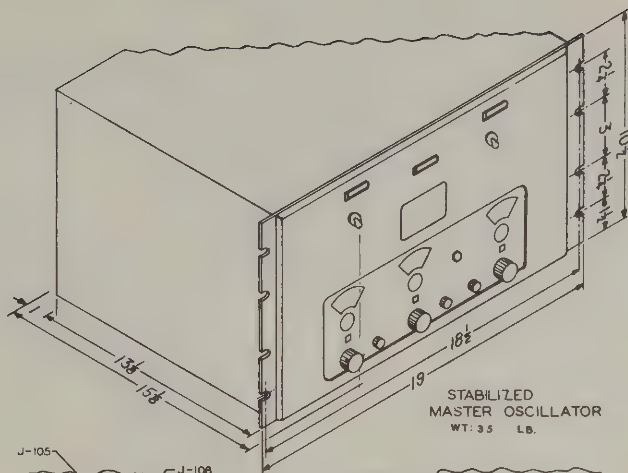
(a) Make certain that the stop screw at the rear edge of the right-hand rail is removed. This screw is inserted from the bottom and used to prevent the coupling unit from rolling off its track after it is in place.

(b) This coupling unit, or rack, must be installed from the rear of the cabinet. Figures 16 and 185 illustrate its placement. It will be noted that the driving motor and its gearing are located on the right-hand end as viewed from the rear

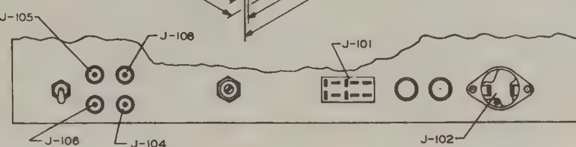
SIDE DUST
FLANGES BY
ALIGNMENT
FLANGES
SCREWS FR

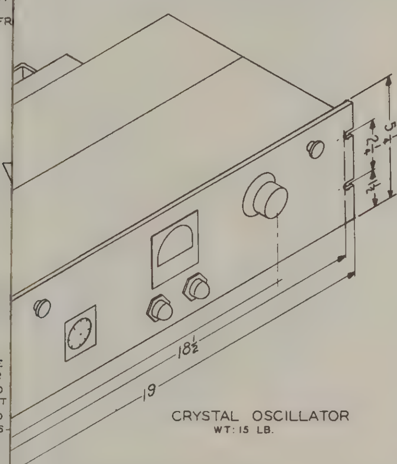


PA POWER CONTROL
WT: 137 LB.



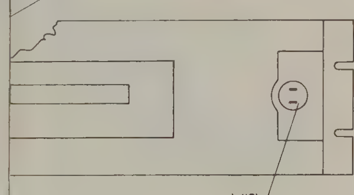
STABILIZED
MASTER OSCILLATOR
WT: 35 LB.

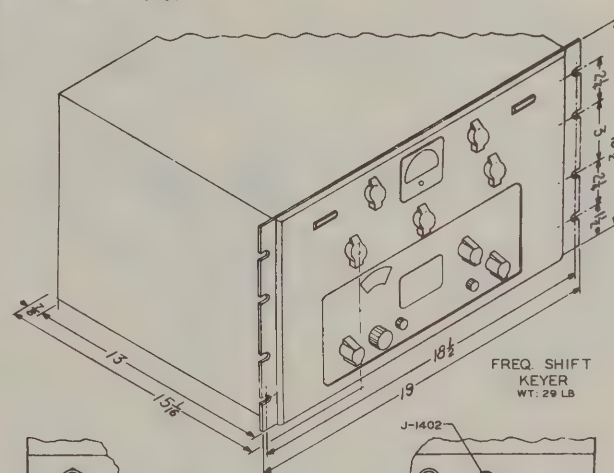




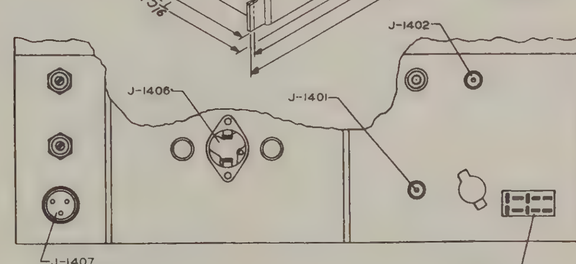
REMOVABLE
DOOR FOR
ACCESS TO
POWERSTAT
MOTOR AND
TERMINALS

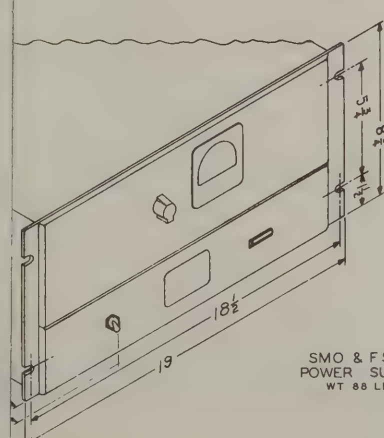
CRYSTAL OSCILLATOR
WT: 15 LB.



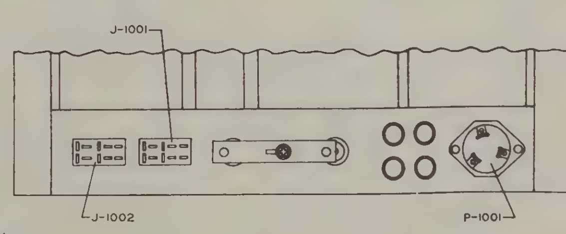


FREQ. SHIFT
KEYER
WT: 29 LB





SMO & FSK
POWER SUPPLY
WT 88 LB.



ment, the general procedures and precautions outlined below apply:

(1) Place the packing case near the position in which the equipment is to be installed.

(2) Cut and remove the steel straps used to reinforce the corners of the packing case.

(3) Remove the nails with a nail puller.

(4) Remove the sides and top of the packing case.

Caution: Prying off the sides or top may result in damage to the equipment.

(5) Remove the bags of dessicant which have been distributed throughout the transmitter for moisture absorption.

(6) Many of the components within the large cabinets have been blocked in place with wooden supports. In some cases padding has been used to protect the equipment. Remove all excess material. Untie all components that have been bound with tape.

(7) Move the cabinet into position on the floor.

Caution: Use extreme care when moving the equipment to avoid damage to the cabinets or components.

(8) Carefully remove the smaller units from their packing cases, but do not install them until they have been thoroughly checked.

(9) While inspecting the equipment visually for damage, check all the units and components received against the master packing slip.

Note. Save the original packing cases and containers for both export and domestic shipments. They can be used again when the equipment is repacked for storage or shipment.

11. Installation of Components Removed Prior to Shipment

a. Power Supply Assembly PP-1088/FRT-26 (figs. 215 through 218). Components removed prior to shipment include the following; perform the steps indicated to install them:

(1) *Tubes.* Return to proper sockets as indicated by type designations on chassis.

(2) *Resistors (ferrule type).* Refer to the parts list, using the symbol stamped on the cabinet, the JAN number in the parts list, and the JAN number on the resistor to determine the correct location.

(3) *High voltage filter choke L-301 (fig. 217).* This choke mounts on the floor of the power supply cabinet. Wires that connect to the choke are clearly marked to indicate the point of connection.

b. Radio Transmitter T-454/FRT-26 (figs. 183 through 188). Components removed prior to shipment include the following: perform the steps indicated to install them:

(1) *Tubes.* Return to proper sockets as indicated by type designations on chassis.

(2) *Resistors (ferrule type).* Refer to the parts list and use the symbol stamped on the cabinet, the JAN number in the parts list, and the JAN number on the resistor to determine the correct location.

(3) *Vacuum capacitors.* Refer to the parts list, using the symbol stamped on the cabinet, the JAN number in the parts list, and the JAN number on the capacitor to determine the correct location.

(4) *Transmission line feed-thru bowls, E-661.* Remount in the roof of the unit in the holes provided.

(5) *Antenna Meters.* Install on the roof of the unit. Holes for mounting are provided.

(6) *IPA filament transformers T-505 and T-506 (fig. 186).* These transformers mount in the bottom of Radio Transmitter T-454/FRT-26. Wires connecting to these filament transformers are clearly marked to indicate the correct connections.

(7) *Coupling network.*

Note. The procedure outlined below should be followed carefully or trouble will be encountered during installation.

(a) Make certain that the stop screw at the rear edge of the right-hand rail is removed. This screw is inserted from the bottom and used to prevent the coupling unit from rolling off its track after it is in place.

(b) This coupling unit, or rack, must be installed from the rear of the cabinet. Figures 16 and 185 illustrate its placement. It will be noted that the driving motor and its gearing are located on the right-hand end as viewed from the rear

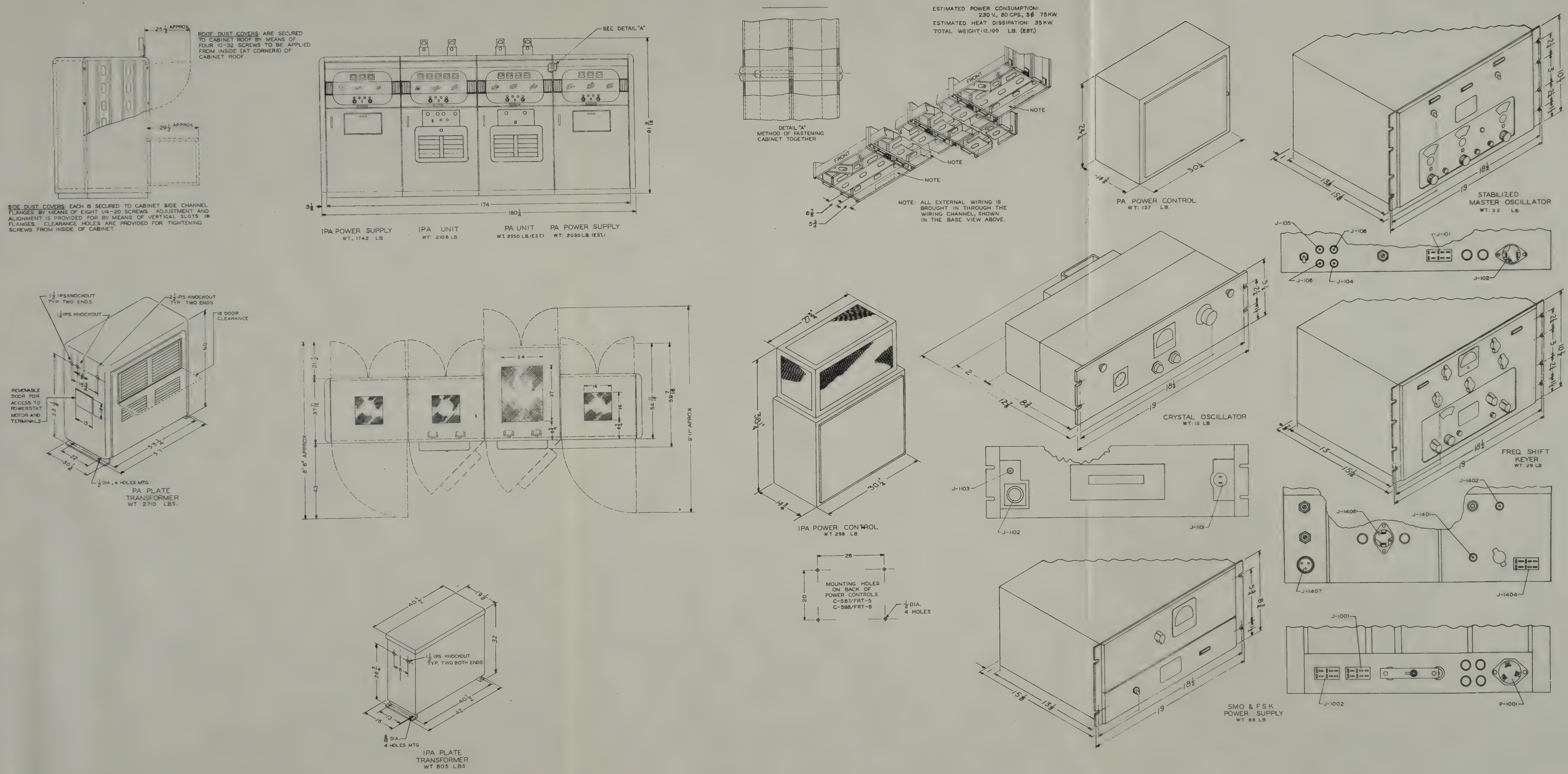


Figure 14. Radio Transmitting Set AN/FRT-22 Installation Drawing.

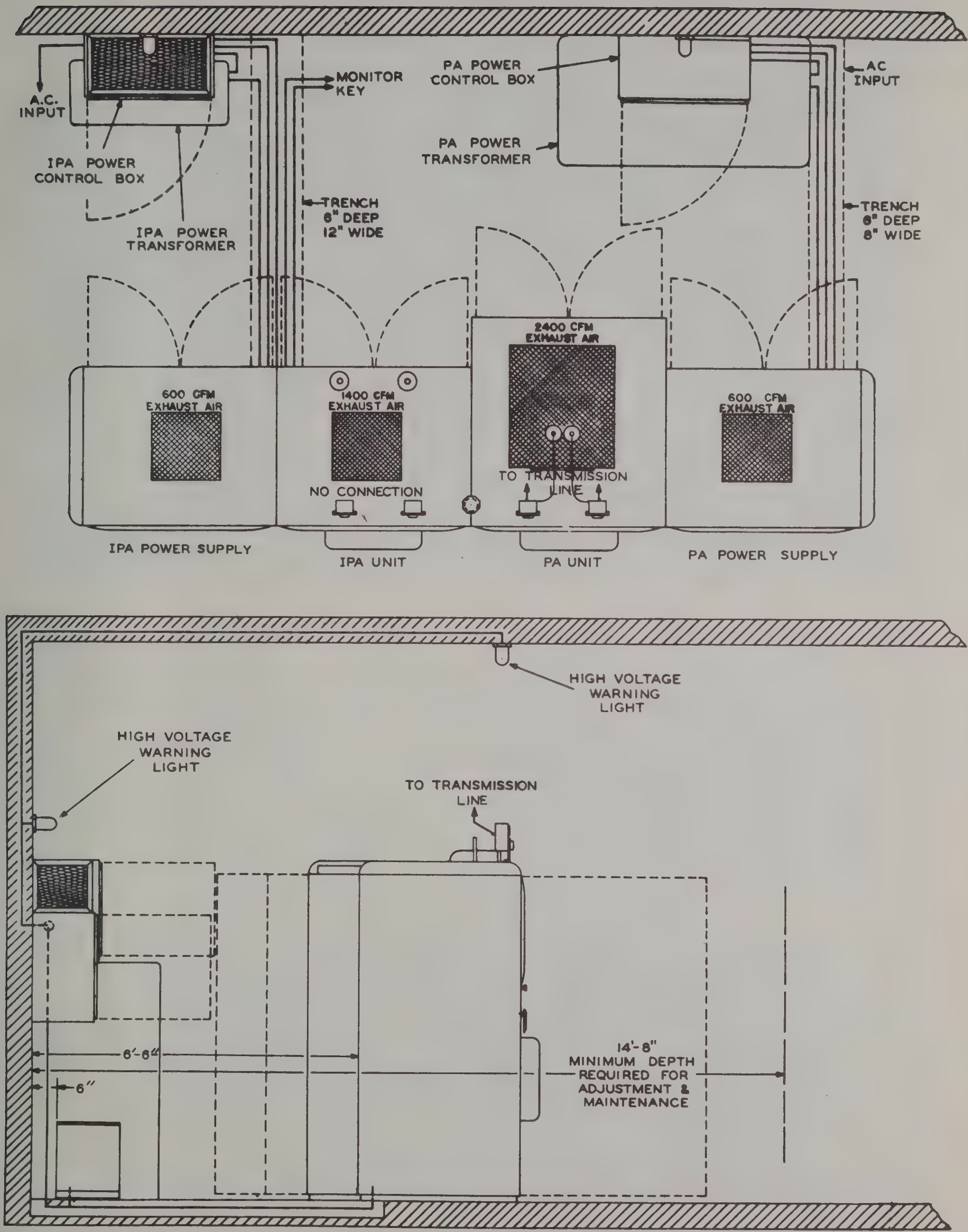


Figure 15. Typical Installation Layout.

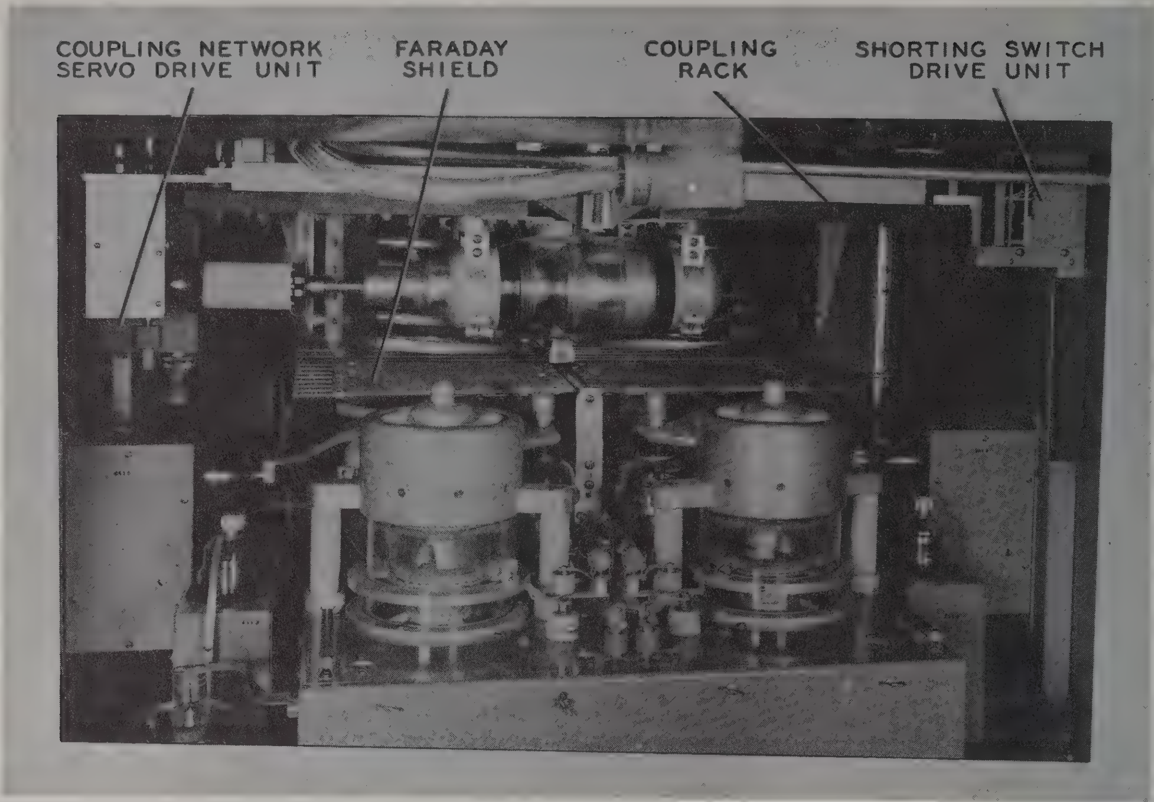


Figure 16. Radio Transmitter T-454/FRT-26, Showing Coupling Platform in Place.

of the cabinet. At least two men will be required to lift the coupler to the top of the cabinet and place it on the tracks. Before attempting to do so, however, make certain that the unit is properly oriented and that the three small wheels have not been damaged. After this unit is in place on its tracks, immediately reinsert the stop screw at the rear edge of the right-hand rail. This is important, as it is very easy to roll this unit too far to the rear and allow it to drop.

(c) A cable will be found hanging over the upper edge of the right-hand plate-tank shield. This cable is to be connected to the coupling unit servo-drive motor. A small double ring wire hook is located at the extreme right end near the center of the coupling-network platform. The

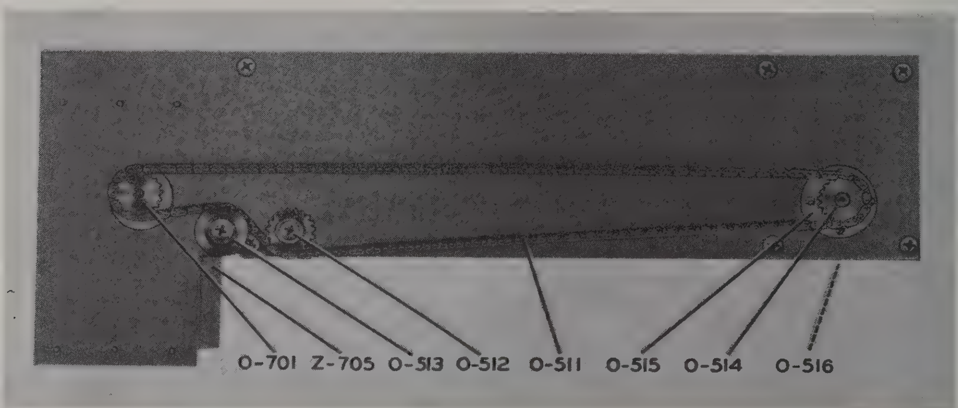


Figure 17. IPA Coupling Network Drive and Chain.

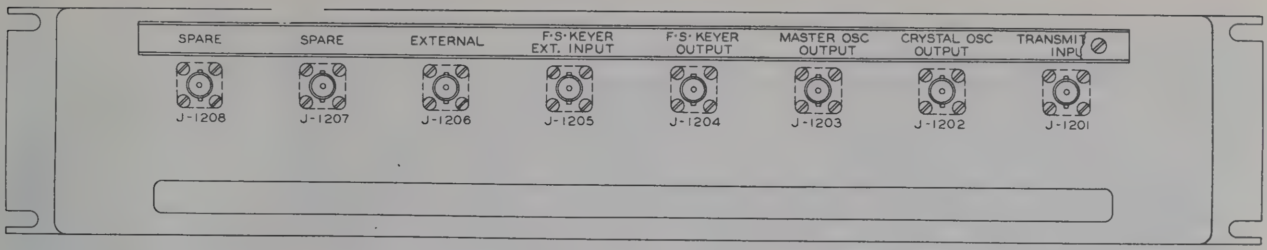


Figure 18. Patch Panel.

drive-motor cable is to be slipped into this ring before being connected to the motor. This insures that the cable does not become entangled in the gearing.

(d) Mount the motor-and-lead-screw assembly (fig. 17) at the rear of the cabinet. Remove the drive chain from this unit, and lay it aside. When the assembly has been properly secured, thread the lead screw into the floating bearing on the antenna rack, and turning the lead screw by hand, operate it until the antenna platform is at its extreme rear position.

(8) *Patch Panel.* This patch panel (fig. 18) is used for connecting the various exciters together and to the transmitter input as required. It is mounted in the upper left corner of the equipment rack (fig. 19).

(9) *R-F Oscillator O-270/FRT-26 (fig. 3).*

(a) Mount this crystal-controlled oscillator unit in the upper right hand corner of the mounting rack in Radio Transmitter T-454/FRT-26 (fig. 19). Use the cables that are mounted behind the rack to connect the output of the oscillator from J-1103 on the oscillator to J-1202 on the patch panel and to connect the control cables from P-1102 located behind the rack, to J-1102 on the oscillator. Connect P-1101 on the a-c cable to J-1101

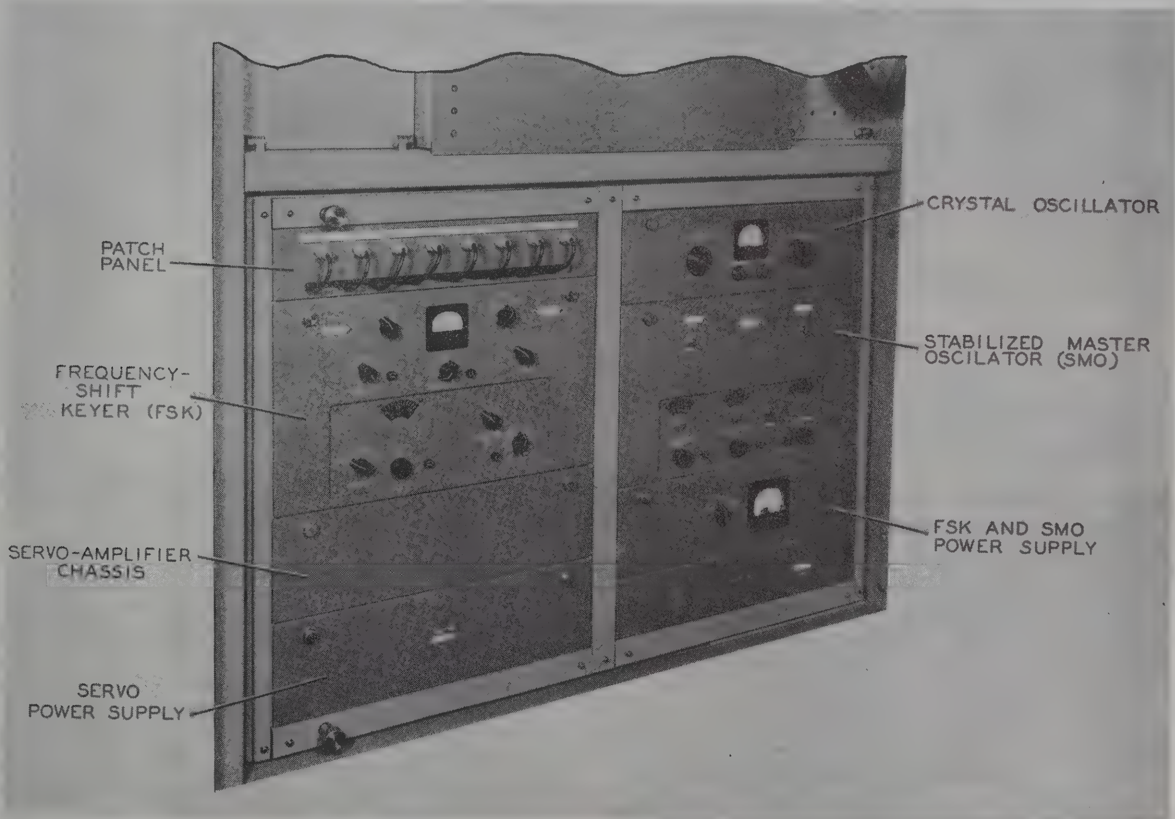


Figure 19. Equipment Rack, Radio Transmitter T-454/FRT-26.

Figure 20. Radio Transmitting Set AN/FRT-22, With Lower Front Doors Open.

on the oscillator, and P-517 on the opposite end of the a-c cable to J-513 for 115 volts a-c for the crystal heater and to supply the primary of the oscillator and buffer filament transformer.

(b) This oscillator is supplied less crystals. It is equipped with an oven which holds up to 10 type CR-27/U crystals. These crystals must be ground for an exact sub-multiple (1/2, 1/3, 1/4, 1/6 or 1/8) of the desired output frequency, and must be between 2,000 and 4,000 kc in basic frequency.

(c) To place crystals in the crystal oven, open the front panel of the oscillator and remove the oven by pulling it directly forward. Notice after the crystal oven has been withdrawn that a flatted shaft extends into the crystal oven. This shaft operates a crystal-selector switch deck inside the oven. The shaft and the selector-switch deck must be carefully fitted together when this oven is replaced or the selector switch is likely to be damaged. <u>For this reason, do not change channels until the oven has been replaced.</u>

(d) Remove the four corner screws from the oven and gently lift off the oven cover. This will expose a smaller inner box with the oven heater wrapped around it. Gently lift this box and let it hinge on the heater and thermostat wires at one end. The crystal sockets will be visible when this inside cover is hinged open. After placing the crystals in their appropriate places, make certain that the identifying chart on the front of the oven is marked with the frequency of the crystal in each position.

Use care in reassembling and replacing the oven.

(10) *Servo power supply (fig. 19).* Mount the servo power supply in the lower left-hand corner of the mounting rack in Radio Transmitter T-454/FRT-26. No connections are to be made to this unit until the servo amplifier unit is installed.

(11) *Servo amplifier enclosure (figs. 6 and 19).* Mount the servo amplifier enclosure just above the servo power supply in the rack. P-901, attached to the servo enclosure, plugs into J-901 on the servo power supply. P-801, attached to the servo enclosure, plugs into J-517 on Radio Transmitter T-454/FRT-26.

(12) *Power Supply PP-454/FRT-5 (figs. 5 and 19).* Mount this power supply in the lower right-hand corner of the rack. It supplies filament and plate voltages for both R-F Oscillator O-91/FRT-5 and Frequency Shift Keyer KY-45/FRT-5. Using the power cable supplied, connect P-1001 on this power supply to J-516 in Radio Transmitter T-454/FRT-26.

(13) *R-F Oscillator O-91/FRT-5 (figs. 2 and 19).* Mount the r-f oscillator in the space just above Power Supply PP-454/FRT-5. Connect J-101 of the oscillator to J-1001 of Power Supply PP-454/FRT-5, using the cable supplied. The r-f output of the oscillator is connected to the patch panel through J-108 on the oscillator and J-1203 on the patch panel. J-106 of the oscillator is available for connecting an external 100-kc source if one is used. J-105 is for the 100-kc output. J-104 is available for 450-kc output. A cable is supplied to connect 115 volts a-c to the unit through J-102 on the oscillator and J-512 in Radio Transmitter T-454/FRT-26.

(14) *Frequency Shift Keyer KY-45/FRT-5 (figs. 4 and 19).* Mount the frequency shift keyer on the left-hand side just above the servo amplifier unit. A power cable is supplied to connect the keyer to Power Supply PP-454/FRT-5. Connect J-1401 on the keyer to J-1205 on the patch panel. With this method of connection, either R-F Oscillator O-270/FRT-26 or R-F Oscillator O-91/FRT-5 may be patched into the frequency-shift keyer. The r-f output of the keyer is connected from J-1402 on the keyer to J-1204 on the patch panel. A cable is supplied with which to connect keying-input jack J-1407 on the fsk unit to key-line out jack J-510 on Radio Transmitter T-454/FRT-26. An a-c cord is provided to connect 115 volts a-c, for the crystal oven, from J-1406 on the keyer to J-511 on Radio Transmitter T-454/FRT-26.

(15) *Fuses.* Verify that the cartridge fuse holders are equipped with fuses and that each is of the proper current rating. Refer to parts list for current rating.

c. Power Supply Assembly PP-1089/FRT-22 (figs. 221 through 224). Components removed prior to shipping include the following; perform the steps indicated to install them:

(1) *Tubes.* Return to proper sockets as indicated by type designations on chassis.

(2) *Resistors (ferrule type).* Refer to the parts list using the symbol stamped on the cabinet, the JAN number in the parts list, and the JAN number on the resistor to determine the correct location.

(3) *Bias Rectifier Plate Transformer (figs. 222 and 224).* Bias rectifier plate transformer T-1608 and the bias supply filter choke L-1602 are to be mounted on the center shelf of Power Supply Assembly PP-1089/FRT-22, and high-voltage filter choke L-1601 is to be mounted in the bottom of the power bay. To facilitate installation, the wires that connect to the chokes and the transformer are clearly marked to indicate the points of connection.

d. R-F Amplifier AM-738/FRT-22 (figs. 198 through 205). Components removed prior to shipping include the following; perform the steps indicated to install them:

(1) *Tubes.* Return to proper sockets as indicated by type designations on chassis.

(a) Tubes for the power amplifier are installed as follows (fig. 21): The figure illustrates how to hold the tube platform for raising or lowering. To lower, turn the handwheel in a counterclockwise direction.

(b) Place three 3X2500A3 tubes on each platform (refer to fig. 22 for correct position of tube). When tubes are in place, snap the tube hold-down clamps on each tube into position.

Caution: Make sure that the tube hold-down clamps are in position when the platform is raised. Failure to do so will damage the clamps or sockets.

(c) To elevate the tubes, turn the handwheel clockwise until the tubes are in place and

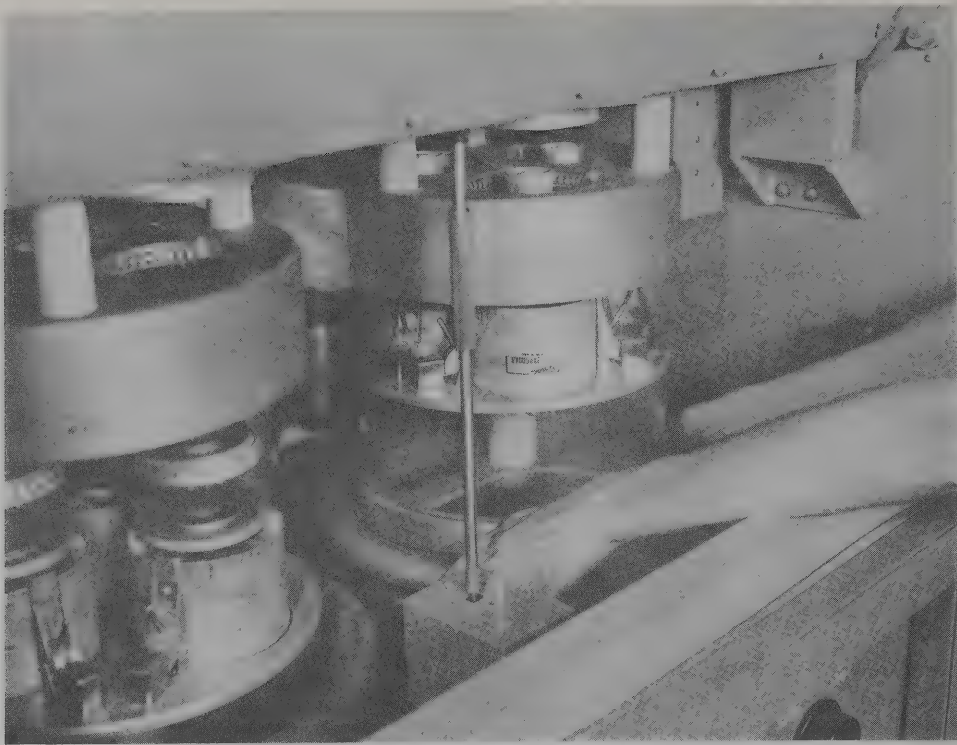


Figure 21. Raising or Lowering Power Amplifier Tubes.

the mechanism snaps into the detent. When raising the tubes, be sure that they are centered and seat properly in their sockets; otherwise, the tubes or sockets may be damaged.

(2) *Resistors (ferrule type).* Refer to the parts list, using the symbol stamped on the cabinet, the JAN number in the parts list, and the JAN number on the resistor to determine the correct location.

(3) *Vacuum capacitors.* Refer to the parts list, using the symbol stamped on the cabinet, the JAN number in the parts list and the JAN number on the capacitor to determine the correct location.

Note. Variable vacuum capacitors require special installation procedure. See paragraphs 69 h.(3) (a) through 69 h.(3) (c) for specific instructions.

(4) *Antenna meters.* Install on roof of R-F Amplifier AM-738/FRT-22. Holes for mounting are provided.

(5) *Power amplifier filament transformers.* Filament transformers T-1501 and T-1502 (fig. 201) are to be mounted on the bottom of R-F Amplifier AM-738/FRT-22 and are inserted from the front after removing the covers. The wires connecting to these filament transformers are clearly marked to indicate correct connections. Rear connections are made by removing the rear cover plate and working through the blower compartment.

(6) *Antenna coupling network.*

(a) Make certain that the stop screws at the rear edge of the rails, which are located in the top of R-F Amplifier AM-738/FRT-22, are removed. The screws are inserted from the bottom and are used to prevent the coupling unit from rolling off the rear of the track.

(b) The coupling unit must be installed from the rear of the unit. Fig. 203 illustrates its placement.

(c) At least two and preferably three men will be needed to lift the coupler to the tracks. Inspect the four rollers to see that they have not been damaged. Lift the unit carefully onto the tracks. Make sure the two front rollers are well seated on the two front portions of the tracks. When the unit is on the tracks, immediately reinsert the stop screws. This is important, since it is very easy to roll this unit too far to the rear and allow it to drop.

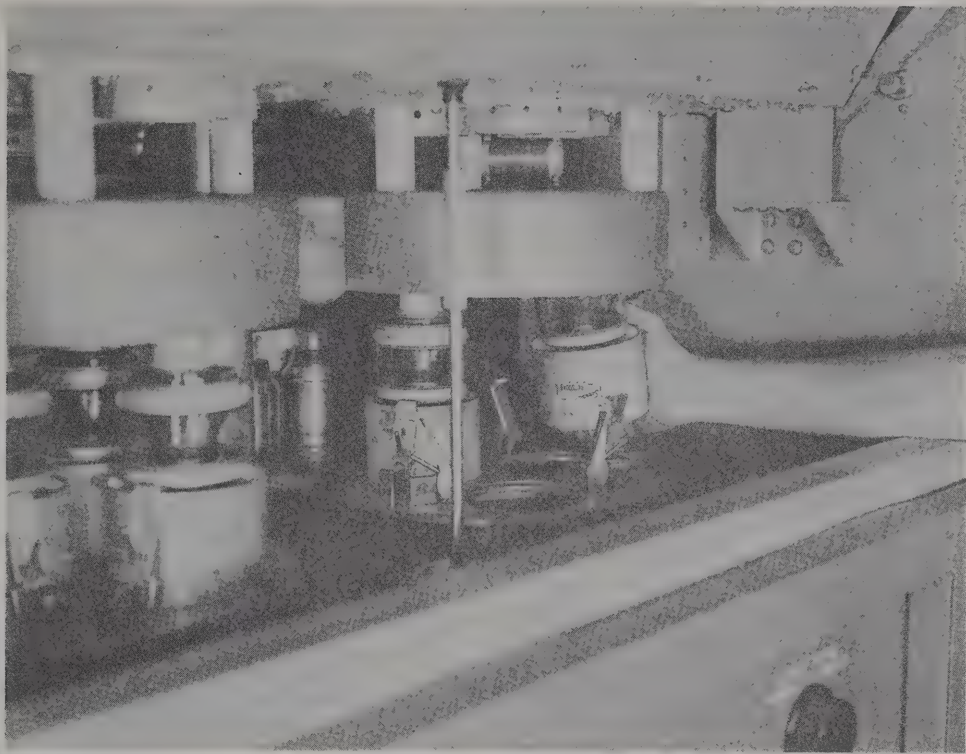


Figure 22. Installing PA Tubes on Platform.

(d) Remove the chain from the drive-motor-and-lead-screw assembly (fig. 23), and set it aside. Mount the assembly in place, securing it with the six bolts. Insert the two screws in the floating bearing. Insert the ground rod, and secure it to the V-shaped brace. Insert the two contact rods into their respective sockets, which are located on the cathode compartment, and secure the rear of the rods with two mycalex pieces.

(e) A cable, located on the right hand side, must be connected to the antenna-tuning servo-drive unit; the jack, J-1504, on the rack connects to this unit. Place the cable in the hook on the side of the rack and then insert the plug into the receptacle.

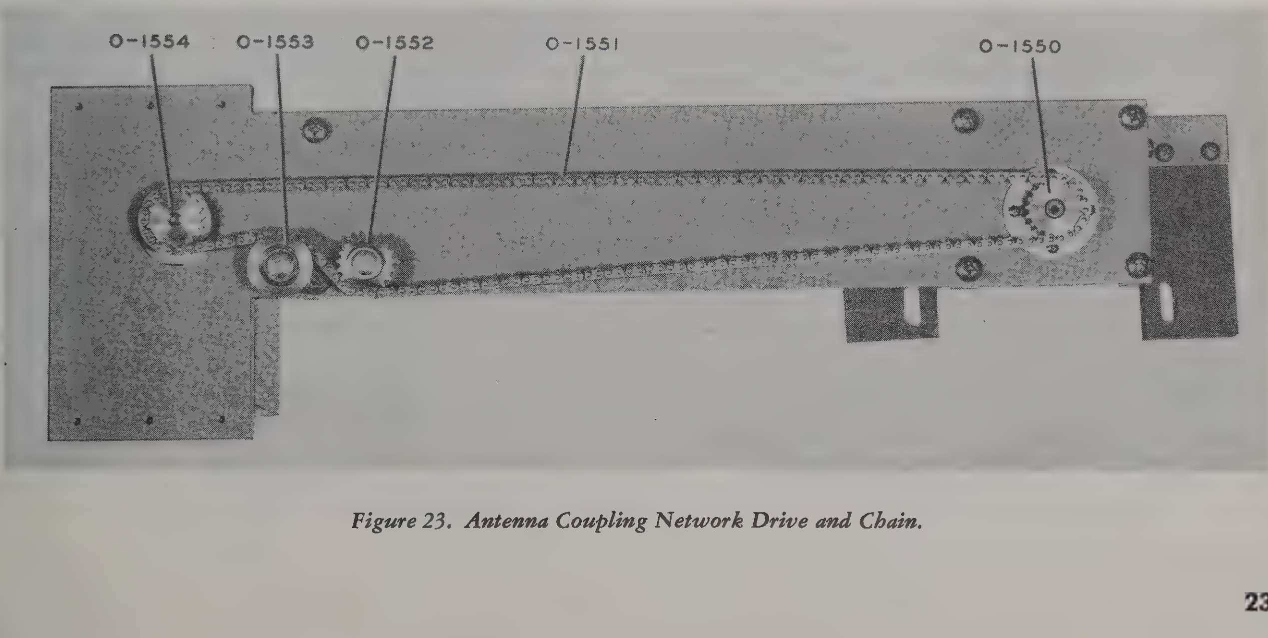


Figure 23. Antenna Coupling Network Drive and Chain.

Insert the plug, on the cable in the upper left corner of this cabinet, into its receptacle, J-1503, on the coupling drive motor.

(f) Turn the lead screw by hand until the coupling unit is at its extreme rear position.

(7) *R-f coupling lines between Radio Transmitter T-454/FRT-26 and R-F Amplifier AM-738/FRT-6.*

(a) Remove the front half of the mycalex feed-thru insulator plates located on the right-side wall of Radio Transmitter T-454/FRT-26. Remove the other half of the feed-thru insulator plates located on the left and inside of the cathode choke enclosure of R-F Amplifier AM-738/FRT-22.

(b) Insert the two pre-formed 1/2-inch copper tubing conductors (approximately 50 inches long) through the cabinet walls, and bolt them in place. These connect to the stationary contact rails, which are supported from the roof of the Radio Transmitter T-454/FRT-26 and to the lugs on the upper side of variable air capacitors C-1585 and C-1586, located in the cathode-choke enclosure of R-F AMplifier AM-738/FRT-22. The right-hand rail is to be connected to the right-hand capacitor by the conductor which is in the top position as it passes through the cabinet walls.

(c) Replace the mycalex feed-thru plates.

(8) *R-F coupling lines between Antenna Coupler and R-F current meters.*

(a) Remove the upper half of the mycalex plate which serves as part of the exhaust air duct in the roof of R-F Amplifier AM-738/FRT-22.

(b) Insert the two curved copper tubing conductors, one connecting each of the contact rails to the meter above it.

(c) Replace the mycalex plate in the roof of the cabinet.

(9) *Transmission lines.*

(a) Connect the r-f transmission line to the open terminals of meters M-1505 and M-1506 located on the top of the R-F Amplifier AM-738/FRT-22.

(b) Use #6 hard-drawn wire for the transmission lines, and space the two wires on 12-inch centers to obtain the required 600-ohm transmission line impedance.

(c) Maintain a clearance of at least 3 feet between the transmission lines and the top of the transmitter cabinets.

(d) Use feed-thru bowl type insulators for running line through building walls.

(e) If more than one antenna is to be used, arrange a system of switches or other means at some convenient point in the transmission line. Maximum values of line currents and voltages should be kept in mind if this is done.

(10) *Servo amplifier enclosure (fig. 9).* The servo amplifier rack is mounted in the lower center of R-F Amplifier AM-738/FRT-22, just above the servo power supply. It is necessary only to slip the three individual servo amplifier units into place so that the plugs on the backs of the units engage the jacks on the back of the servo amplifier enclosure.

12. External Connections

Refer to the table below for conduit and wire sizes required for the power and control lines.

Note. With the exception of the r-f transmission lines which are connected to the antenna meters at the top of R-F Amplifier AM-738/FRT-22, all of the external connections are brought through the bottom of the cabinets to terminal boards.

CONDUIT AND WIRE SIZES

Connection	Conduit	Recommended Wire
Station Power Line Switch to Power Control Unit	2"	#000 Underwriter's Code RH
Power Control Unit to Power Supply Unit	1"	#8 Underwriter's Code RH
Power Supply Control C-1402/FRT-26 to Power Transformer TF-196/FRT-26 Primary	2"	#2 Underwriter's Code RH

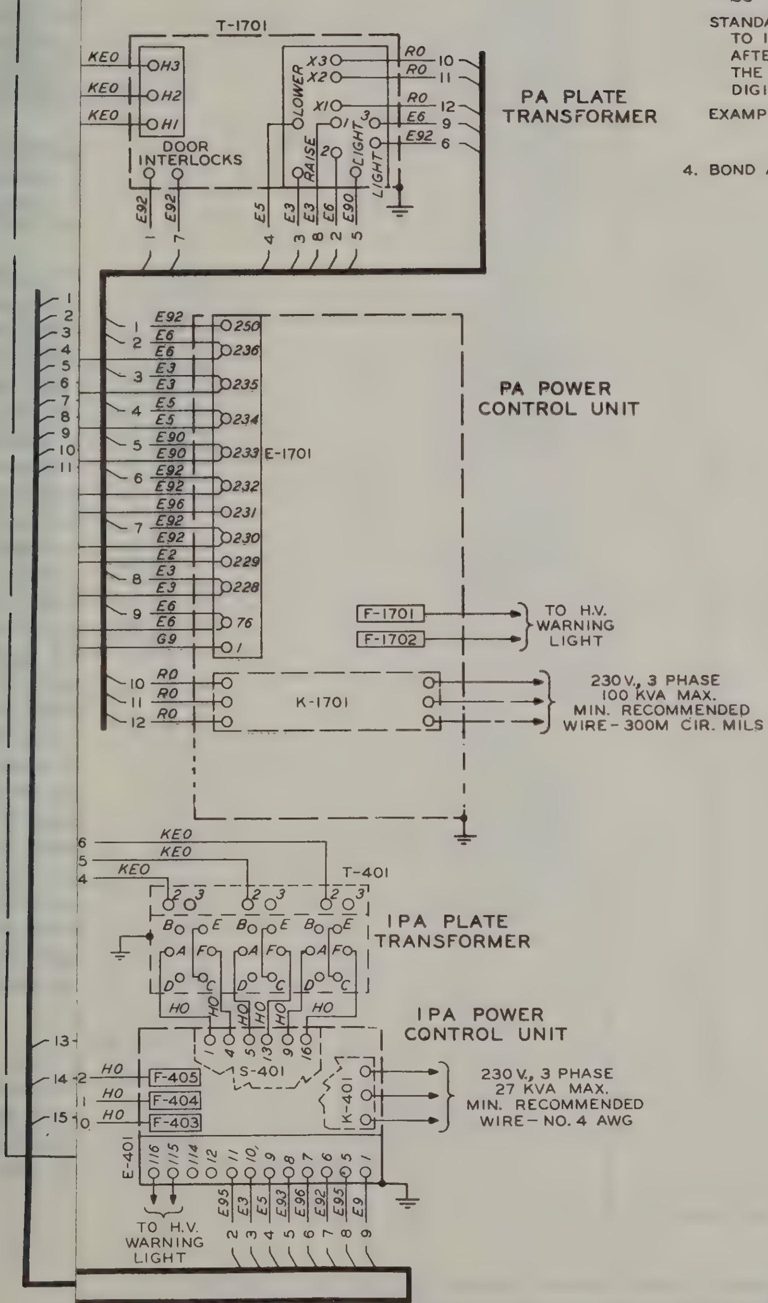
NOTES:

1. WIRES ENCLOSED IN BROKEN LINES ARE INTERCABINET PREFORMED CABLES.
2. WIRING TO EXTERNAL UNITS INSTALLED IN CONDUIT, TRENCH, METAL RACEWAY, OR OTHER PROTECTIVE ENCLOSURE.
3. WIRE SIZE CODE.

E	NO. 14 AWG
G	NO. 10 AWG
KE	NO. 14 AWG 15,000 VOLT CABLE
R	NO. 0000 AWG
H	NO. 8 AWG
CS	NO. 18 AWG SHIELDED

   STANDARD RMA COLOR CODE IS USED TO INDICATE WIRE COLORS. FIRST DIGIT AFTER LETTER SIZE DESIGNATION INDICATES THE COLOR OF THE WIRE BODY, SECOND DIGIT INDICATES COLOR OF TRACER.

   EXAMPLE: E92 IS NO. 14AWG WHITE WITH RED TRACER.
4. BOND ALL UNITS TO A COMMON GROUND.



Insert the plug, on the cable in the upper left corner of this cabinet, into its receptacle, J-1503, on the coupling drive motor.

(f) Turn the lead screw by hand until the coupling unit is at its extreme rear position.

(7) *R-f coupling lines between Radio Transmitter T-454/FRT-26 and R-F Amplifier AM-738/FRT-6.*

(a) Remove the front half of the mycalex feed-thru insulator plates located on the right-side wall of Radio Transmitter T-454/FRT-26. Remove the other half of the feed-thru insulator plates located on the left and inside of the cathode choke enclosure of R-F Amplifier AM-738/FRT-22.

(b) Insert the two pre-formed 1/2-inch copper tubing conductors (approximately 50 inches long) through the cabinet walls, and bolt them in place. These connect to the stationary contact rails, which are supported from the roof of the Radio Transmitter T-454/FRT-26 and to the lugs on the upper side of variable air capacitors C-1585 and C-1586, located in the cathode-choke enclosure of R-F Amplifier AM-738/FRT-22. The right-hand rail is to be connected to the right-hand capacitor by the conductor which is in the top position as it passes through the cabinet walls.

(c) Replace the mycalex feed-thru plates.

(8) *R-F coupling lines between Antenna Coupler and R-F current meters.*

(a) Remove the upper half of the mycalex plate which serves as part of the exhaust air duct in the roof of R-F Amplifier AM-738/FRT-22.

(b) Insert the two curved copper tubing conductors, one connecting each of the contact rails to the meter above it.

(c) Replace the mycalex plate in the roof of the cabinet.

(9) *Transmission lines.*

(a) Connect the r-f transmission line to the open terminals of meters M-1505 and M-1506 located on the top of the R-F Amplifier AM-738/FRT-22.

(b) Use #6 hard-drawn wire for the transmission lines, and space the two wires on 12-inch centers to obtain the required 600-ohm transmission line impedance.

(c) Maintain a clearance of at least 3 feet between the transmission lines and the top of the transmitter cabinets.

(d) Use feed-thru bowl type insulators for running line through building walls.

(e) If more than one antenna is to be used, arrange a system of switches or other means at some convenient point in the transmission line. Maximum values of line currents and voltages should be kept in mind if this is done.

(10) *Servo amplifier enclosure (fig. 9).* The servo amplifier rack is mounted in the lower center of R-F Amplifier AM-738/FRT-22, just above the servo power supply. It is necessary only to slip the three individual servo amplifier units into place so that the plugs on the backs of the units engage the jacks on the back of the servo amplifier enclosure.

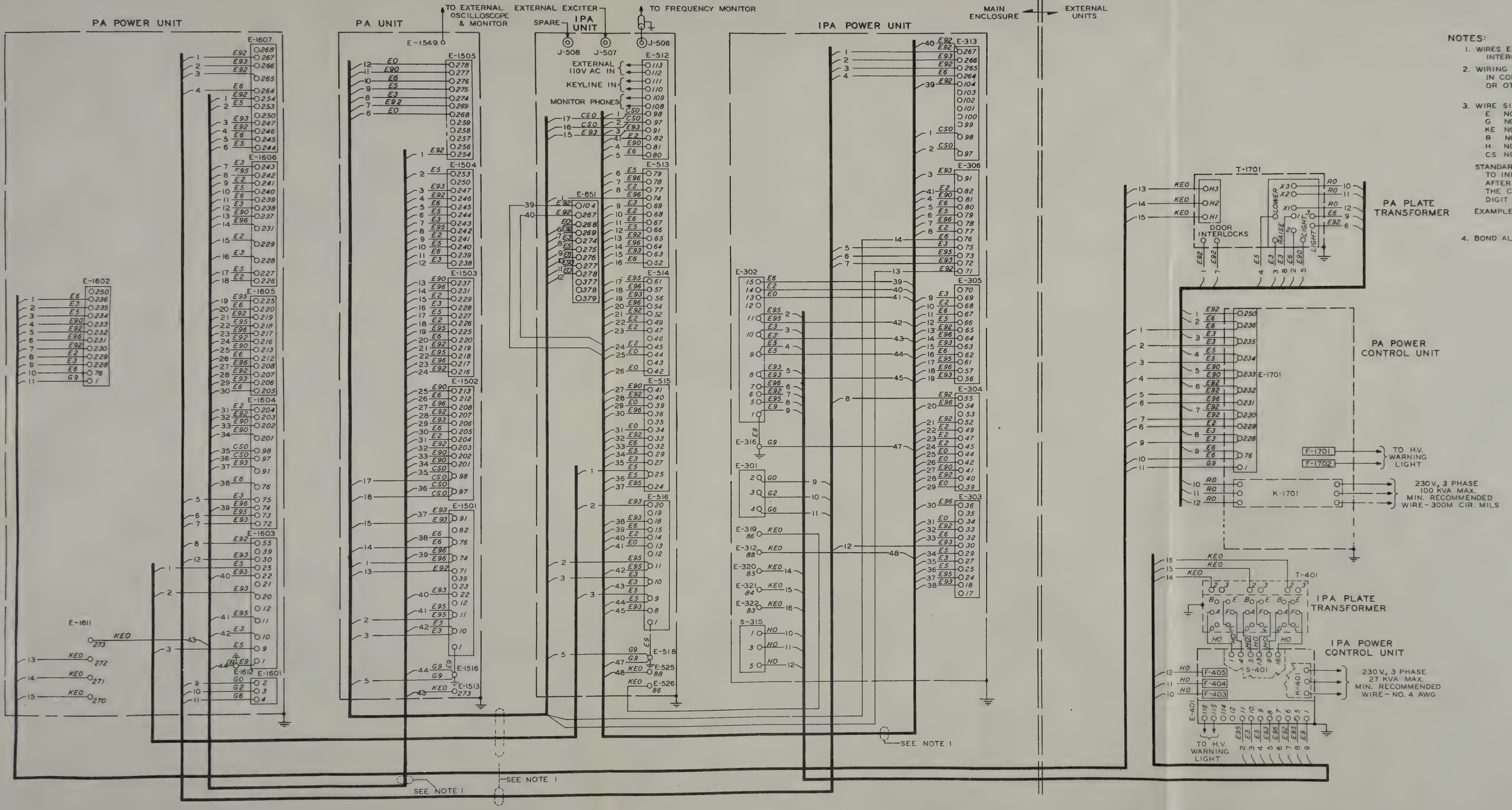
12. External Connections

Refer to the table below for conduit and wire sizes required for the power and control lines.

Note. With the exception of the r-f transmission lines which are connected to the antenna meters at the top of R-F Amplifier AM-738/FRT-22, all of the external connections are brought through the bottom of the cabinets to terminal boards.

CONDUIT AND WIRE SIZES

Connection	Conduit	Recommended Wire
Station Power Line Switch to Power Control Unit	2"	#000 Underwriter's Code RH
Power Control Unit to Power Supply Unit	1"	#8 Underwriter's Code RH
Power Supply Control C-1402/FRT-26 to Power Transformer TF-196/FRT-26 Primary	2"	#2 Underwriter's Code RH



NOTES:

1. WIRES ENCLOSED IN BROKEN LINES ARE INTERCABINET PREFORMED CABLES.
2. WIRING TO EXTERNAL UNITS INSTALLED IN CONDUIT, TRENCH, METAL RACEWAY, OR OTHER PROTECTIVE ENCLOSURE.
3. WIRE SIZE CODE.
   - E NO. 14 AWG
   - G NO. 10 AWG
   - KE NO. 14 AWG 15,000 VOLT CABLE
   - R NO. 0000 AWG
   - H NO. 8 AWG
   - CS NO. 18 AWG SHIELDED

   STANDARD RMA COLOR CODE IS USED TO INDICATE WIRE COLORS. FIRST DIGIT AFTER LETTER SIZE DESIGNATION INDICATES THE COLOR OF THE WIRE BODY, SECOND DIGIT INDICATES COLOR OF TRACER.

   EXAMPLE: E92 IS NO. 14AWG WHITE WITH RED TRACER.
4. BOND ALL UNITS TO A COMMON GROUND.

Figure 24. Intercabinet Cabling Diagram.

Connection	Conduit	Recommended Wire
Power Control C-598/FRT-6 to Power Transformer TF-197/FRT-22	2"	#00 Underwriter's Code RH
Power Transformer TF-196/FRT-26 to Power Supply Assembly PP-1088/FRT-26, Power Transformer TF-197/FRT-22 to Power Supply Assembly PP-1089/FRT-22	1-1/4"	#14 High Voltage Wire such as Neon Sign Cable
Power Supply Control C-1402/FRT-26 to Power Supply Assembly PP-1088/FRT-26, Power Control C-598/FRT-6 to Power Supply Assembly PP-1089/FRT-22	1"	#14 Underwriter's Code RH
Power Supply Control C-1402/FRT-26 and Power Control C-598/FRT-6 to High Voltage Warning Lights	1/2"	#14 Underwriter's Code RH

a. Primary Power Connections. Connect two three-phase, three-wire 230-volt a-c lines from the station distribution panel to Power Supply Control C-1402/FRT-26 and Power Control C-598/FRT-6. Figures 225 and 229 show the primary power terminals to which these lines will be connected. The three lines are connected directly to the top, or line terminals of the Westinghouse motor-operated breakers K-401 and K-1701. The motor and cover must be removed to do so. On K-401, do not remove the wires that are already on these terminals and connected to fuses F-403, F-404 and F-405. Connect Radio Transmitter T-454/FRT-26, Power Supply Assembly PP-1088/FRT-26, R-F Amplifier AM-738/FRT-22, Power Supply Assembly PP-1089/FRT-22, Power Transformer TF-196/FRT-26, Power Transformer TF-197/FRT-22, Power Supply Control C-1402/FRT-26, and Power Control C-598/FRT-6 together as indicated on the intercabinet cabling schematic diagram, Figure 24. Using #14 wire, run a separate 115-volt line into Radio Transmitter T-454/FRT-26 and connect it to E-512, terminals 112 and 113. Figure 24 and notes included thereon indicate whether cable or bulk wire is supplied. The color code (see appendix) will aid in selecting the proper wire from the bulk wire furnished.

b. Keying Line. Using shielded wire, feed the keying line out through the bottom of the transmitter and lay it in the trench along with the conduit. Connect the keying line to E-512, terminals 110 and 111, connecting the shield or grounded side of the line to terminal 111.

c. Ground Connections. The transmitter enclosure should be connected to a good ground system, which should consist of at least all of the metal parts of the building in the vicinity of the transmitter. These metal areas should be well bonded together and connected to the base of the transmitter at as many places as is practical, using wide copper strap or heavy wire. Any connections made of flexible copper braid should be kept as short as possible, because this material is not a particularly satisfactory conductor of high-frequency currents.

13. Service on Receipt of Used or Reconditioned Equipment

a. Follow the instructions in paragraph 9 for uncrating, unpacking and checking the equipment.

b. Check the used or reconditioned equipment for tags or other indications pertaining to changes in the wiring of the equipment. If any changes in wiring have been made, note the change in this manual, preferably on the schematic diagram.

c. Check the controls for ease of operation. If lubrication is required, refer to the lubrication instructions in Chapter 3, Section II.

d. Perform the installation and connection procedures given in paragraphs 11 and 12.

Section II. CONTROLS AND INSTRUMENTS

14. List of Controls and their Functions

Haphazard operation or improper setting of controls can cause damage to electronic equipment. For this reason, it is important to know the function of every control. The actual operation of the equipment is discussed in the next section of this manual. The following table lists the controls of Radio Transmitting Set AN/FRT-22 and indicates what they do.

Note. Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26, with Power Transformer TF-196/FRT-26 and Power Supply Control C-1402/FRT-26, comprise a complete and independent fifteen-kilowatt transmitter. The controls on the panel of Radio Transmitter T-454/FRT-26 which refer to POWER AMP. (e.g. POWER AMP. PLATE TUNING, POWER AMP. LOADING, ANT. TUNING) are referred to in this text as the intermediate power amplifier controls. Do not confuse these IPA controls with the PA controls on the panel of R-F Amplifier AM-738/FRT-22. The IPA units occupy the left half of the transmitter; the power amplifier and its power supply occupy the right half.

a. Frequency Shift Keyer KY-45/FRT-5 (fig. 25).

Control	Function
PLATE ON-OFF Switch (S-1401)	Controls application of 250 volts dc and 150 volts dc from power supply to components of keyer. The PLATE ON lamp lights when switch is in ON position.
METER 807 switch (S-1402)	Permits switching M-1401 to either the grid or plate circuit of power amplifier V-1404.
OUTPUT LEVEL potentiometer (R-1430)	Controls r-f output level of keyer.
PHASE MODULATION potentiometer and switch (R-1485, S-1408)	Connects 250-volt plate supply to phase-modulation oscillator V-1407 when switch is on; potentiometer controls magnitude of 200-cps phase modulation.
WAVE SHAPING switch (S-1404)	Modifies the output waveshape of the keying tube by connecting different combinations of series inductance and bridged capacitance.
TEST - OPERATE switch (S-1403)	Permits selection of CARRIER, SPACE, MARK, FSK, or PHOTO.
MAIN TUNING capacitor (C-1405)	Tunes output circuits of balanced modulators, buffer, and power amplifier.
TRANSMITTER MULTIPLICATION switch (S-1405)	Sets magnitude of frequency shift in ratios corresponding to frequency multiplication factor of the transmitter.
BASIC SHIFT potentiometer (R-1458)	Adjust magnitude of frequency shift.
KEYER BALANCE potentiometer (R-1450)	Equalizes magnitude of balanced keyer output voltage. This condition is reached only when TEST-OPERATE switch is in CARRIER position.
FREQ. SHIFT CALIBRATION potentiometer (R-1464)	Adjusts gain of phase-shifting amplifier V-1409, which in turn calibrates the BASIC SHIFT control.
PHOTO ADJUST potentiometer (R-1448)	Adjusts photo signal to balanced keyer tube.

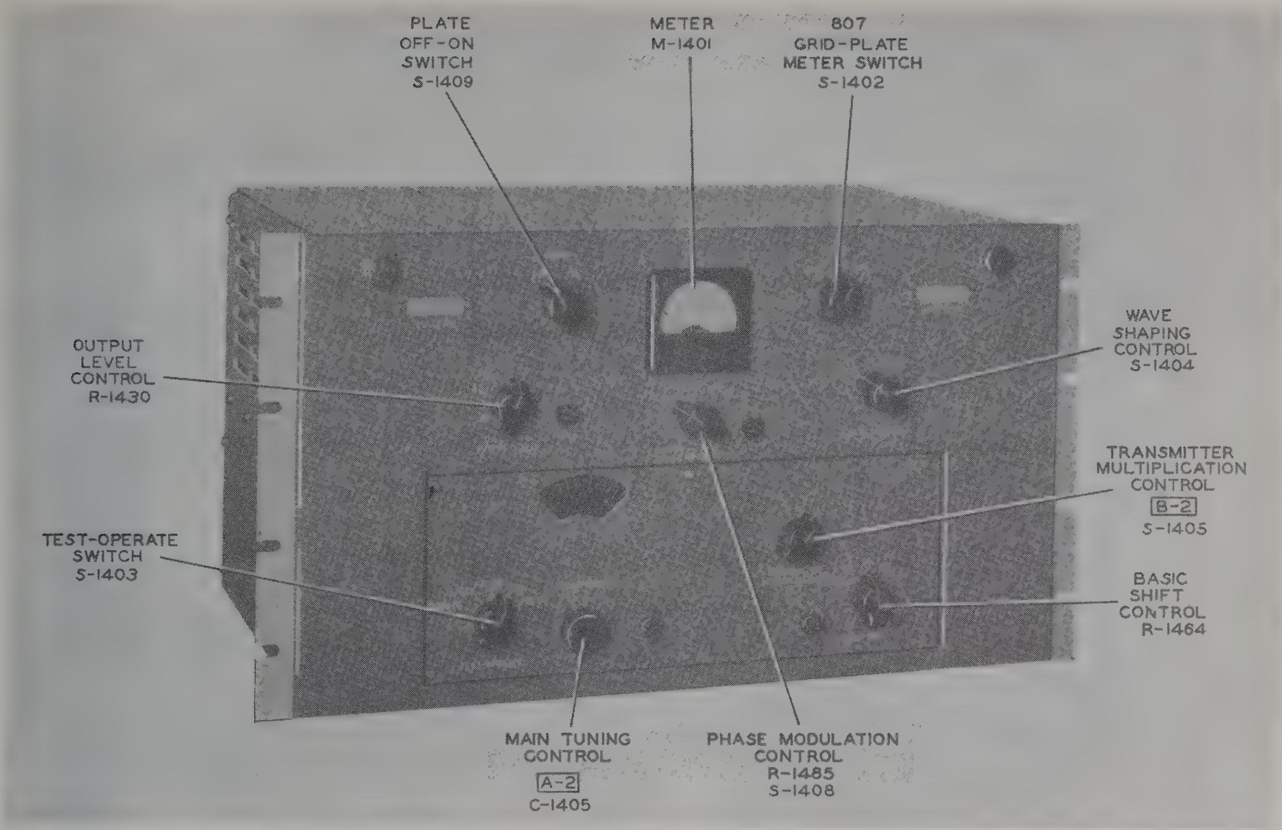


Figure 25. Frequency-Shift Keyer KY-45/FRT-5 Controls.

Control	Function
LIMITER ADJUST potentiometer (R-1439)	Adjusts bias on balanced keyer tube and limiter tube.
MODULATOR BALANCE potentiometer (R-1416)	Equalizes output of balanced modulators.
EXT. OSC. ATTENUATOR switch (S-1401)	Permits adjusting level of r-f input from external oscillator.

b. R-F Oscillator O-91/FRT-5 (fig. 26).

Control	Function
PLATE ON-OFF switch (S-101)	Controls application of 250 volts dc and 150 volts dc from power supply to components of oscillator. The PLATE ON lamp lights when switch is in ON position.
SET UP - OPERATE switch(S-103)	Controls AFC motor. When switch is in OPERATE position, the AFC ON lamp lights.
INTERPOLATION OSCILLATOR variable inductor (L-105)	Interpolates between 5-kc points as indicated on the calibrated dial.

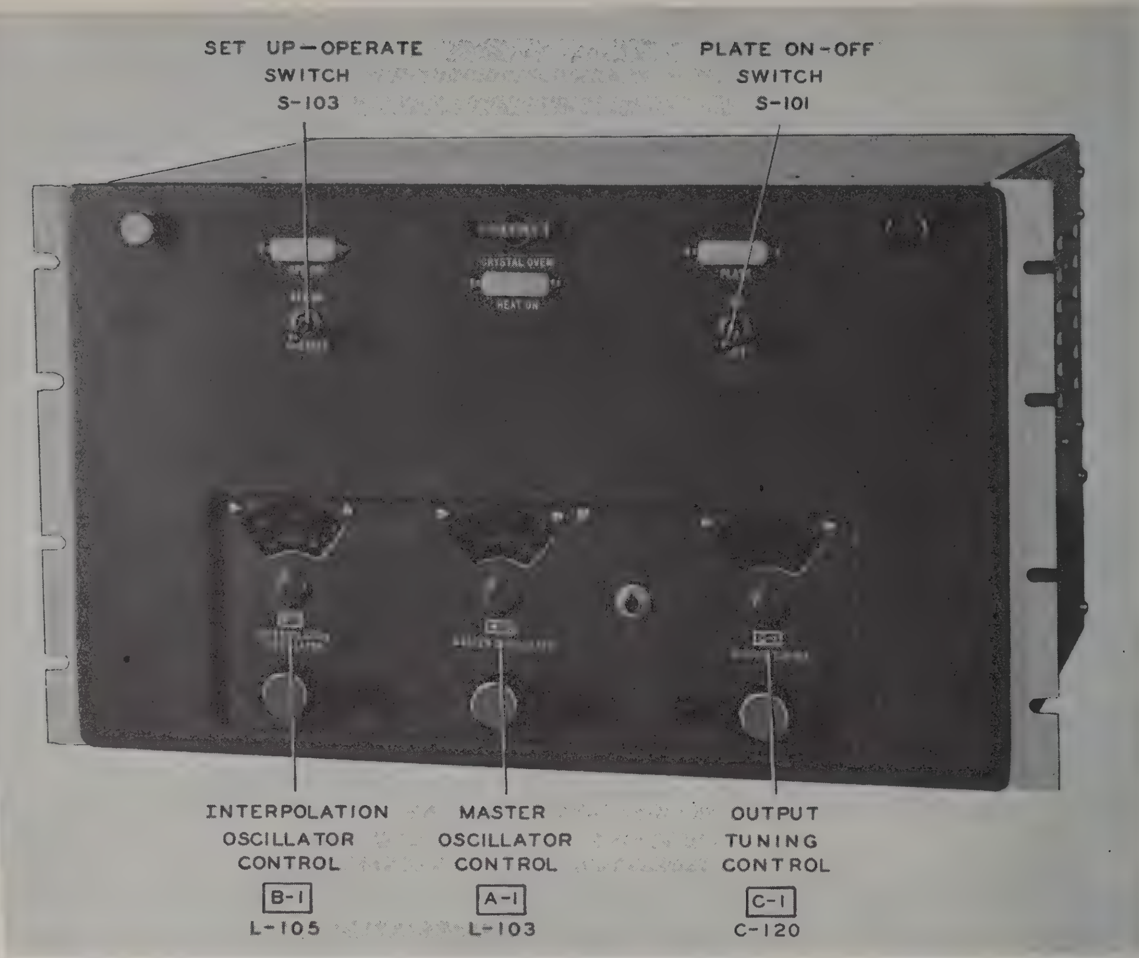


Figure 26. R-F Oscillator O-91/FRT-5 Controls.

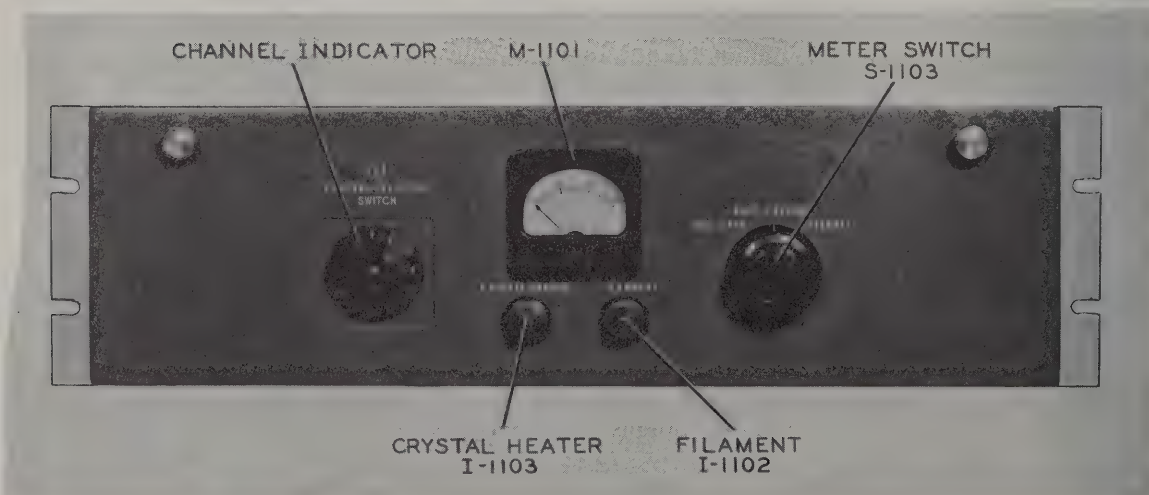


Figure 27. R-F Oscillator O-270/FRT-26 Controls.

b. R-F Oscillator O-91/FRT-5 (fig. 26). (contd)

Control	Function
MASTER OSCILLATOR variable inductor (L-103)	Determines output frequency as indicated on the calibrated dial.
OUTPUT TUNING variable capacitor (C-120)	Tunes output circuit of V-112, output circuit of V-113, and plate circuits of the two harmonic amplifiers, V-104 and V-105.
100 KC EXT. - INT. switch (S-105)	Connects internal 100-kc crystal in the circuit in INT. position and makes provision for external 100-kc source in EXT. position.
OUTPUT CONTROL potentiometer (R-165)	Controls r-f output level of unit.

c. R-F Oscillator O-270/FRT-26 (fig. 27).

Control	Function
CRYSTAL SELECTOR SWITCH indicator	Indicates channel on which transmitter is set. This is not a manual control, but is operated by an autopositioner.
OSC. CATH., BUFF. CATH., EXTERNAL switch (S-1103)	Inserts front panel meter in oscillator cathode or buffer cathode.

d. Power Supply PP-454/FRT-5 (fig. 28).

Control	Function
ON-OFF switch (S-1001)	Controls application of 230 volts ac to primaries of power transformers T-1001 and T-1002.
METER SWITCH	Switches meter into power supply output circuits to measure voltages.

e. Power Supply Assembly PP-1088/FRT-26 (figs. 29 and 30).

Control	Function
P.A. FILAMENT VOLTAGE meter (M-303)	Reads left IPA filament voltage or right IPA filament voltage.
LINE VOLTAGE meter (M-302)	Reads each of the three regulated phase voltages.
P.A. PLATE VOLTAGE meter (M-301)	Reads the high-voltage IPA plate supply voltage.
FILAMENT lamp (I-304), amber	Indicates filaments on in IPA and IPA power supply bays when lighted.
L.V. PLATE lamp (I-305), green	Indicates IPA low-voltage plate supply on when lighted.
H.V. PLATE lamp (I-306), red	Indicates IPA high-voltage plate supply when lighted.

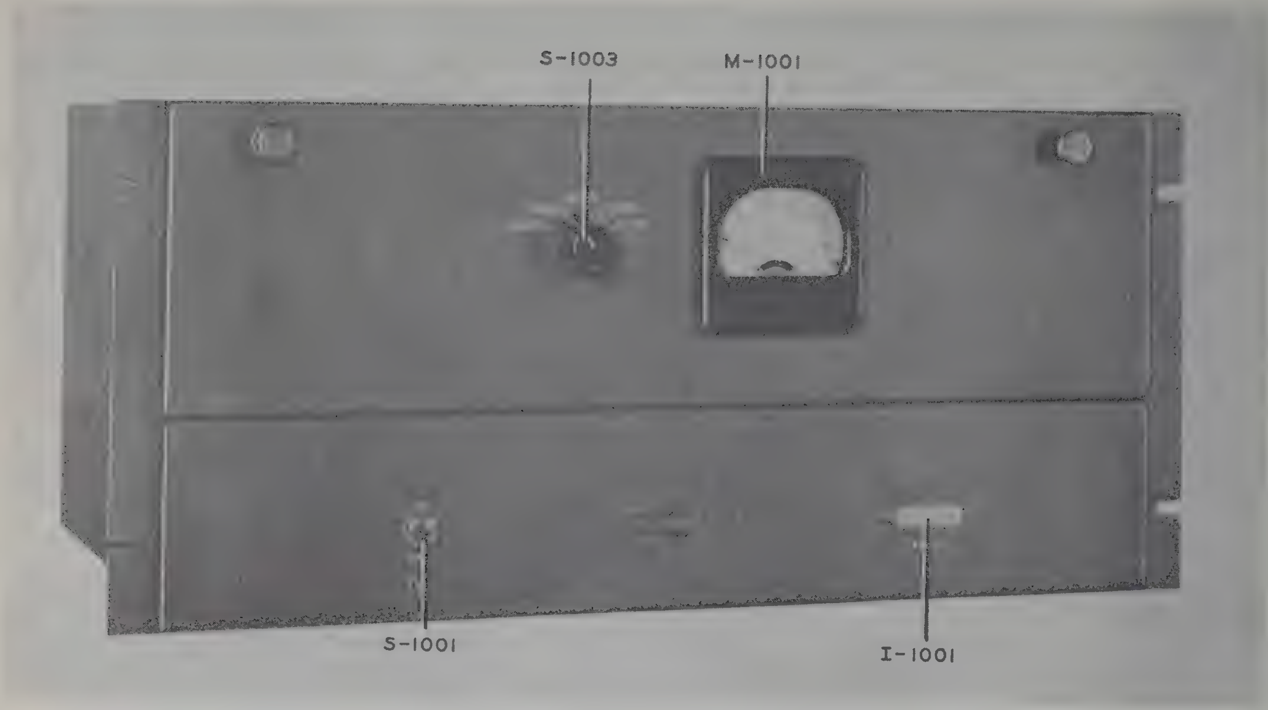


Figure 28. Power Supply PP-454/FRT-5 Controls.

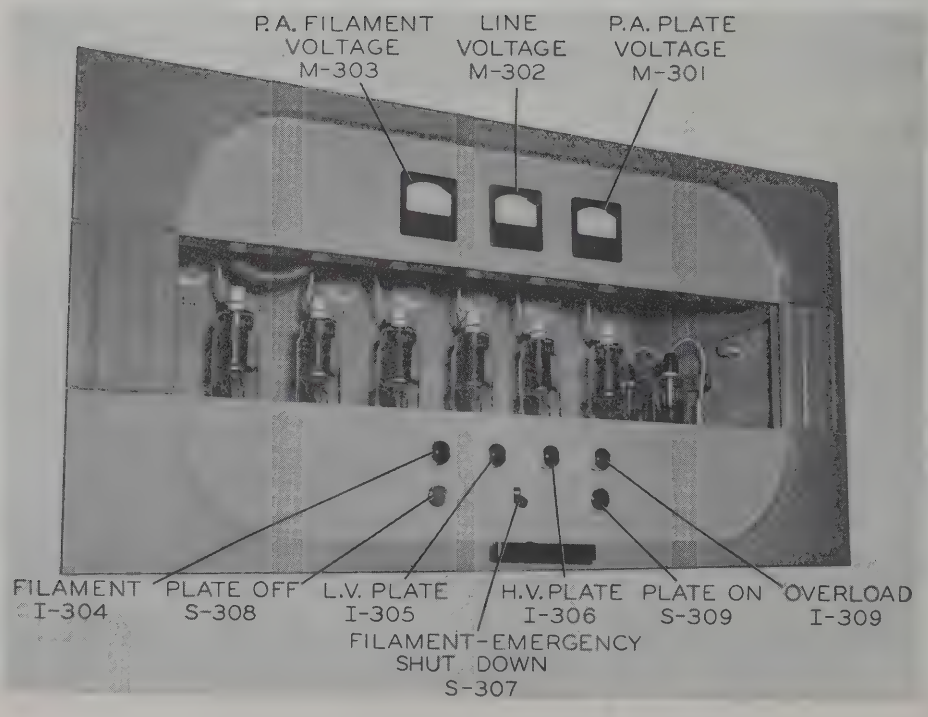


Figure 29. Upper Front Panel, Power Supply Assembly PP-1088/FRT-26 Controls.

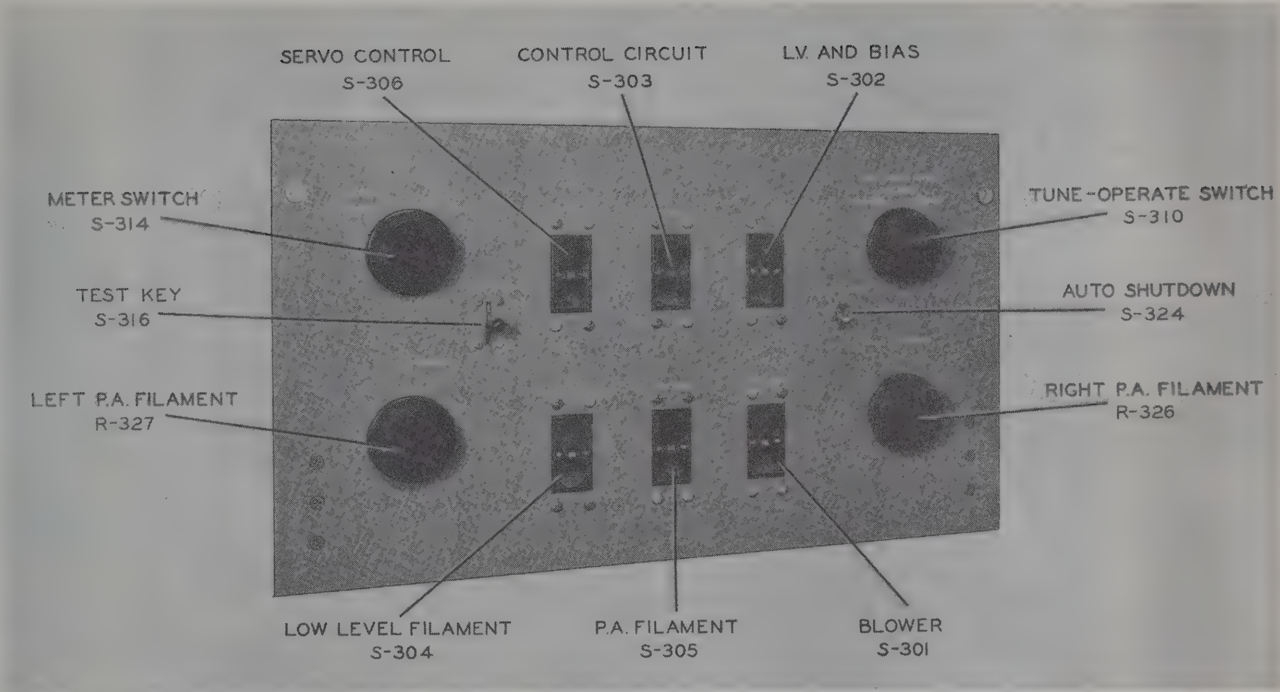


Figure 30. Lower Control Panel, Power Supply Assembly PP-1088/FRT-26 Controls.

e. Power Supply Assembly PP-1088/FRT-26 (figs. 29 and 30). (contd)

Control	Function
OVERLOAD lamp (I-309), amber	Indicates that overload has occurred within the automatic restart interval.
PLATE OFF switch (S-308)	Shuts off all plate voltages in the transmitter.
PLATE ON switch (S-309)	Turns on all plate voltages in the IPA unit.
FILAMENT - EMERGENCY SHUT DOWN switch (S-307)	Turns on filament voltages in the IPA and IPA power supply. Interlocked with FILAMENT - EMERGENCY SHUT DOWN switch S-510 located on the IPA bay. Both must be in ON position.
	Shuts off all voltages, plate and filament, that may be on, in the transmitter.
METER SWITCH (S-314)	Inserts LINE VOLTAGE and P.A. FILAMENT VOLTAGE meters into indicated positions. Provides metering each of the regulated phases and the IPA filament voltages.
SERVO CONTROL circuit breaker (S-306)	Controls application of 230 volts ac to servo power supply.
CONTROL CIRCUIT circuit breaker (S-303)	Controls application of 230 volts ac to the relays and timers of the control circuit which control high voltage, low voltage, and d-c bias power supplies.
L.V. AND BIAS circuit breaker (S-302)	Controls application of 230 volts ac to primary windings of the low-voltage and bias supply plate transformers.

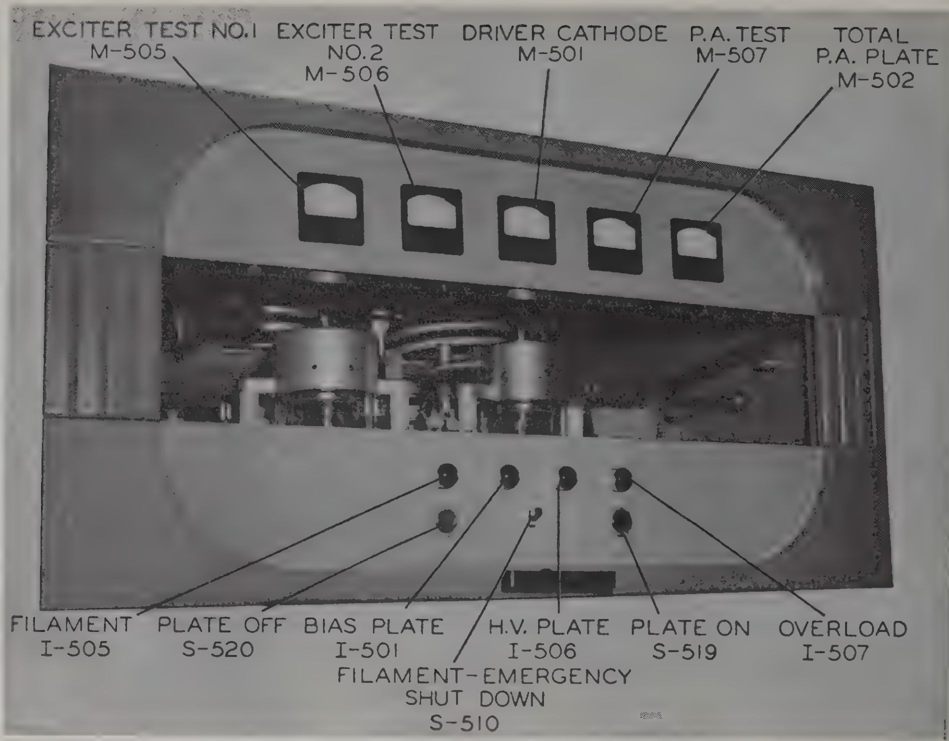


Figure 31. Upper Control Panel, Radio Transmitter T-454/FRT-26 Controls.

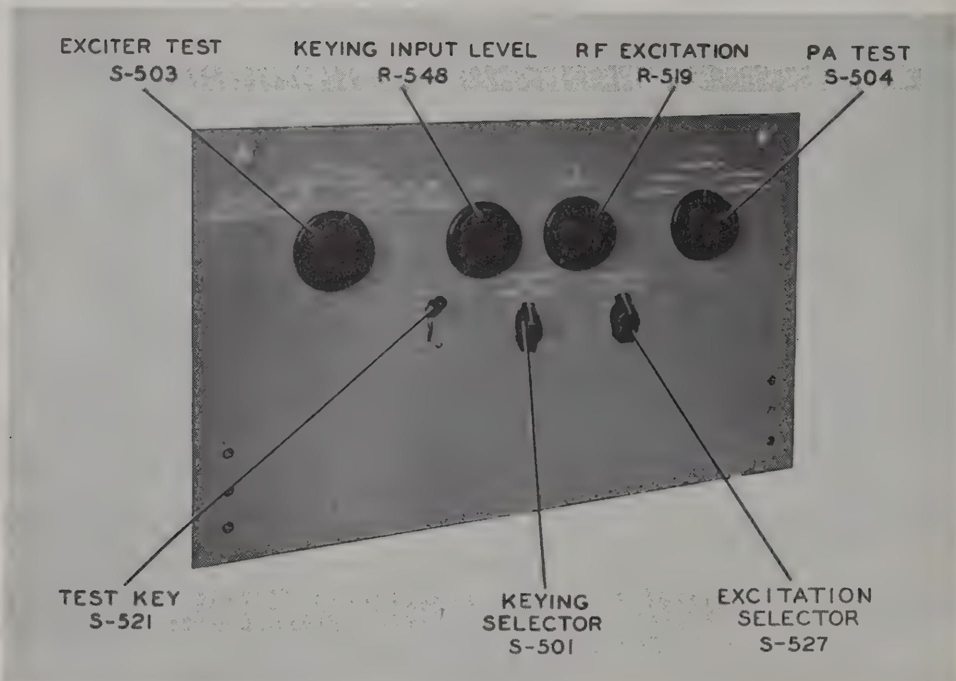


Figure 32. Lower Control Panel, Radio Transmitter T-454/FRT-26 Controls.

Control	Function
TUNE-OPERATE SWITCH (S-310)	Permits selecting low-voltage tune, high-voltage tune, or operate condition.
TEST KEY lever-action switch (S-316)	Applies test keying voltage to keyer when KEYING SELECTOR switch is in LOCAL position.
AUTO SHUTDOWN switch (S-324)	Completes circuit to auto-shutdown timer when in AUTO SHUTDOWN position. Disables automatic shutdown feature when in OFF position.
LEFT P.A. FILAMENT rheostat (R-327)	Adjusts left IPA filament voltage.
LOW LEVEL FILAMENT circuit breaker (S-304)	Controls application of 230 volts ac to primaries of all IPA rectifiers and to the buffer, multiplier, and driver filament transformers.
P.A. FILAMENT circuit breaker (S-305)	Controls application of 230 volts ac to primaries of the IPA filament transformers.
BLOWER circuit breaker (S-301)	Controls application of 230 volts ac to IPA blower motors.
RIGHT P.A. FILAMENT rheostat (R-326)	Adjusts right IPA filament voltage.
Primary voltage regulator circuit breaker (S-315)	Controls the application of 230-volt three-phase ac to the primary voltage regulator.

f. Radio Transmitter T-454/FRT-26 (figs. 31, 32, and 33).

Control	Function
EXCITER TEST NO. 1 meter (M-505)	Reads currents indicated and switched by EXCITER TEST switch (S-503).
	Reads SSB input standing-wave ratio.
EXCITER TEST NO. 2 meter (M-506)	Reads currents indicated and switched by EXCITER TEST switch (S-503).
DRIVER CATHODE meter (M-501)	Reads driver cathode current.
P.A. TEST meter (M-507)	Reads currents indicated and switched by P.A. TEST switch (S-504).
TOTAL P.A. PLATE meter (M-502)	Reads total IPA plate current to both IPA tubes.
FILAMENT lamp (I-505), amber	Indicates filaments on in IPA and IPA power supply bays when lighted.
BIAS PLATE lamp (I-501), green	Indicates IPA bias supply on when lighted.
H.V. PLATE lamp (I-506), red	Indicates IPA high-voltage plate supply on when lighted.

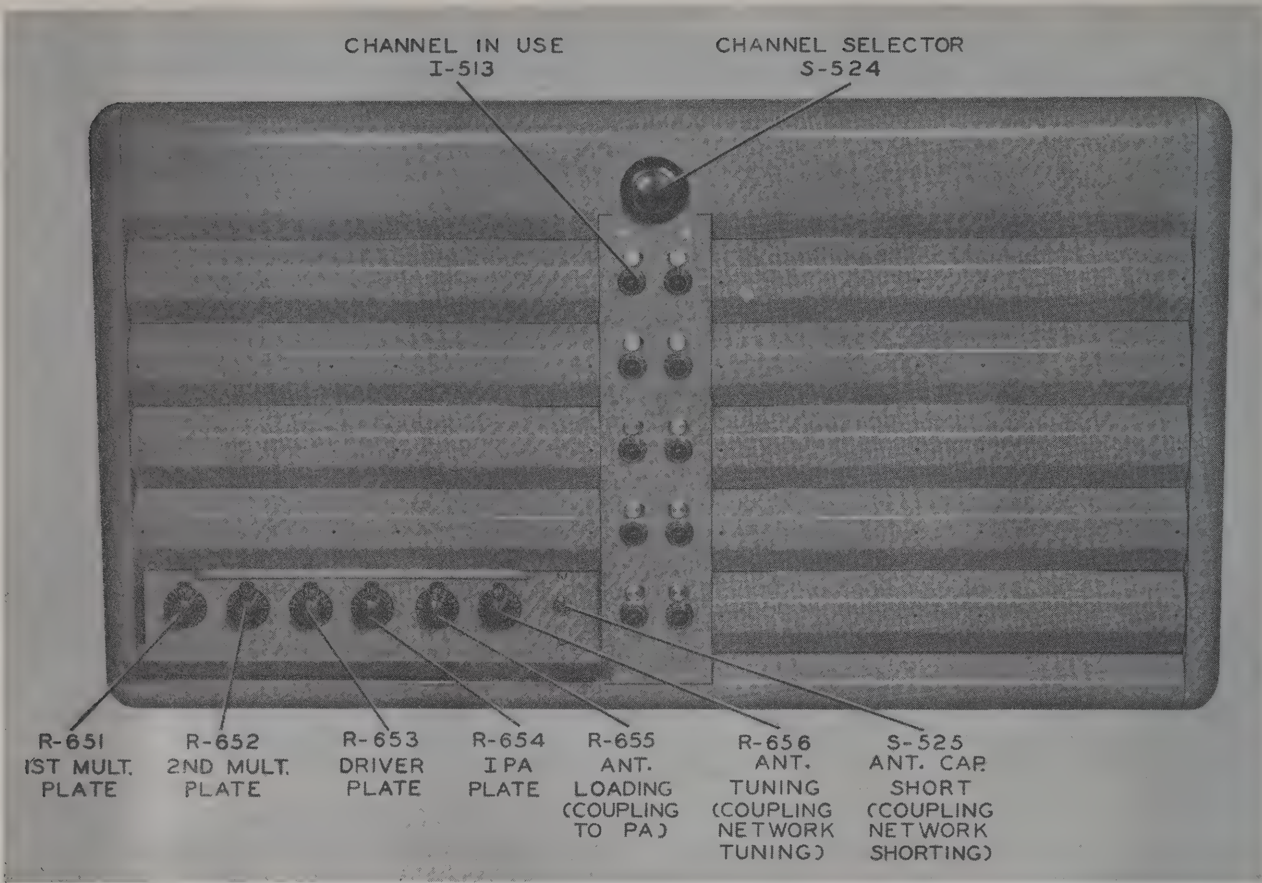


Figure 33. Preset Tuning Control Panel, Radio Transmitter T-454/FRT-26 Controls.

f. Radio Transmitter T-454/FRT-26 (figs. 31, 32, and 33). (contd)

Control	Function
OVERLOAD lamp (I-507), amber	Indicates that overload has occurred within the automatic restart interval.
PLATE OFF switch (S-520)	Shuts off all plate voltages in the transmitter.
PLATE ON switch (S-519)	Turns on all plate voltages in the IPA unit.
FILAMENT - EMERGENCY SHUT DOWN switch (S-510)	Turns on filament voltages in the IPA and IPA power supply. Interlocked with FILAMENT - EMERGENCY SHUT DOWN switch S-307 located on the IPA power supply bay. Both must be in ON position. Shuts off all voltages, plate and filament, that may be on in the transmitter.
EXCITER TEST switch (S-503)	Inserts EXCITER TEST meters No. 1 and No. 2 (M-505 and M-506) simultaneously into the following circuits with the indicated meter ranges: #1 buffer cathode -- 100 ma #2 buffer and 1st mult. grid -- 10 ma

Control	Function
	#1 1st mult. cathode -- 100 ma #2 2nd mult. grid -- 10 ma #1 2nd mult. cathode -- 200 ma #2 driver grid -- 50 ma #1 Left IPA grid r-f peak -- 1000 v #2 Left IPA plate r-f peak -- 10 kv #1 Right IPA grid r-f peak -- 1000 v #2 Right IPA plate r-f peak -- 10 kv
KEYING INPUT LEVEL potentiometer (R-548)	Controls keying voltage input to keyer tube.
R.F. EXCITATION potentiometer (R-519)	Controls screen voltage of first and second multiplier tubes and is used to set IPA grid current level.
P.A. TEST switch (S-504)	Inserts P.A. TEST meter in the following circuits with the indicated meter ranges: Left IPA grid -- 0.5 amp. Right IPA grid -- 0.5 amp. Total grid -- 1.0 amp. Left IPA cathode -- 5.0 amp. Right IPA cathode -- 5.0 amp.
TEST KEY lever-action switch (S-521)	Applies test keying voltage to keyer when KEYING SELECTOR switch is in LOCAL position.
KEYING SELECTOR switch (S-501)	Permits selecting REMOTE, LOCAL, or FSK.
EXCITATION SELECTOR switch (S-527)	CW position: Disables functions of hv disconnect relay K-509. Energizes Driver filament transformer T-503. Connects EXCITER TEST NO. 1 meter to EXCITER TEST switch. 1-SWR position: Allows hv disconnect relay K-509 to operate normally. De-energizes Driver filament transformer. Connects EXCITER TEST NO. 1 meter to SSB input swr detector. SSB position: Allows hv disconnect relay K-509 to operate normally. De-energizes driver filament transformer. Connects EXCITER TEST meter to EXCITER TEST switch.
Channel selector switch (S-524)	Operates channel-selecting autopositioner to choose frequency channel.
1st MULTIPLIER PLATE TUNING potentiometers (R-651.1 -- R-651.10)	Varies resonant frequency of V-502 plate tank circuit through servo system.
2nd MULTIPLIER PLATE TUNING potentiometers (R-652.1 -- R-652.10)	Varies resonant frequency of V-503 plate tank circuit through servo system.
DRIVER PLATE TUNING potentiometers (R-653.1 -- R-653.10)	Varies resonant frequency of V-504 plate tank circuit through servo system.

Control	Function
POWER AMP. PLATE TUNING potentiometers (R-654.1 -- R-654.10)	Varies resonant frequency of V-505 and V-506 plate tank circuit through servo system.
POWER AMP. LOADING potentiometers (R-655.1 -- R-655.10)	Varies relative position of output coupling network to IPA plate tank circuit through servo system.
ANT. TUNING potentiometers (R-656.1 -- R-656.10)	Varies resonant frequency of output coupling network through servo system.
ANT. CAP. SHORT switches (S-525.1 -- S-525.10)	Shorts out C-571, opens circuit, or grounds it to balance tank circuit throughout frequency range.
KEYING INPUT FOR MARK switch (S-502)	Sets up on-off keyer for operation from keying impulses negative to ground for mark, positive to ground for mark, polarized negative for mark, or polarized positive for mark.
OUTPUT LEVEL potentiometer (R-580)	Adjusts amplitude of keying pulse applied to keyed stages of transmitter.
TEST KEYING LEVEL potentiometer (R-568)	Adjusts amplitude of d-c voltage applied to keyer input through test key.
ADJ. A potentiometer (R-554)	Adjusts voltage gain of phase inverter portion of keyer.
ADJ. B potentiometer (R-570)	Adjusts ratio of positive and negative test voltages for polarized positive keyer setup.
ADJ. C potentiometer (R-573)	Adjusts ratio of positive and negative test voltages for polarized negative setup.

g. R-F Amplifier AM-738/FRT-22 (figs. 34, 35, and 36).

Control	Function
RF TEST meter (M-1504)	Reads voltages indicated and switched by R.F. TEST switch (S-1502).
DC TEST meter (M-1502)	Reads currents indicated and switched by D.C. TEST switch (S-1501).
TOTAL GRID CURRENT meter (M-1503)	Reads total grid current to all PA tubes.
TOTAL PLATE CURRENT meter (M-1501)	Reads total plate current to all PA tubes.
FILAMENT lamp (I-1505), amber	Indicates filaments on in PA and PA power supply bays when lighted.
BIAS PLATE lamp (I-1506), green	Indicates PA bias supply on when lighted.
H.V. PLATE lamp (I-1507), red	Indicates PA high-voltage plate supply on when lighted.
OVERLOAD lamp (I-1508), amber	Indicates that overload has occurred within the automatic restart interval.

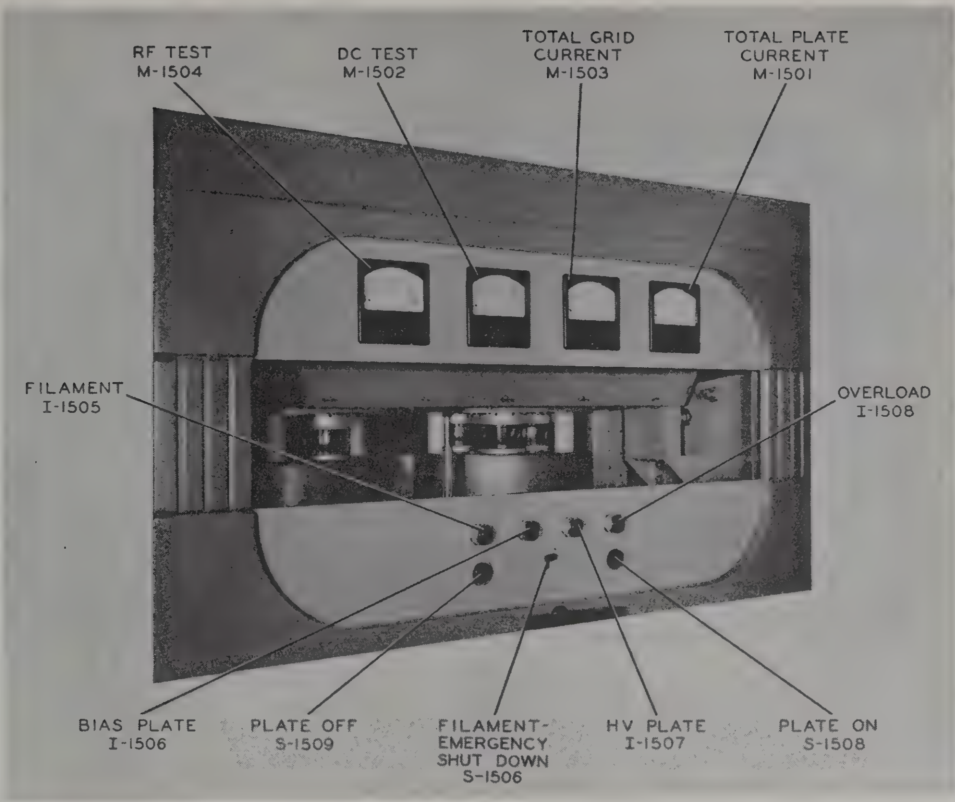


Figure 34. Upper Control Panel, R-F Amplifier AM-738/FRT-22 Controls.

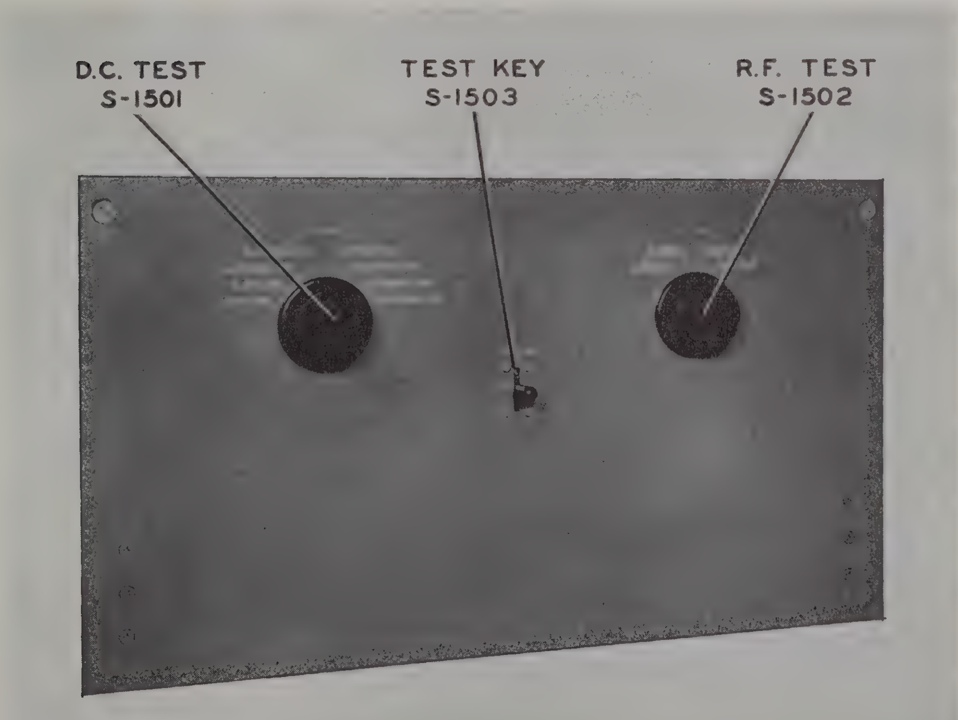


Figure 35. Lower Control Panel, R-F Amplifier AM-738/FRT-22 Controls.

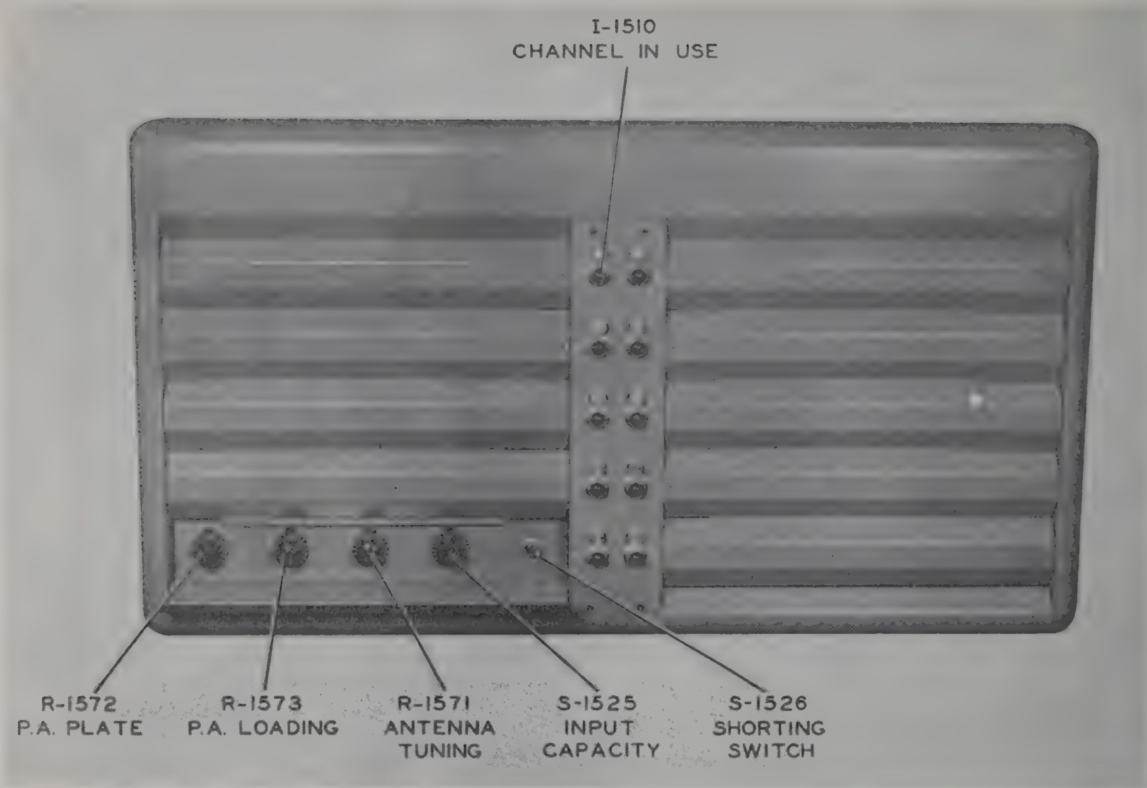


Figure 36. Preset Tuning Control Panel, R-F Amplifier AM-738/FRT-22 Controls.

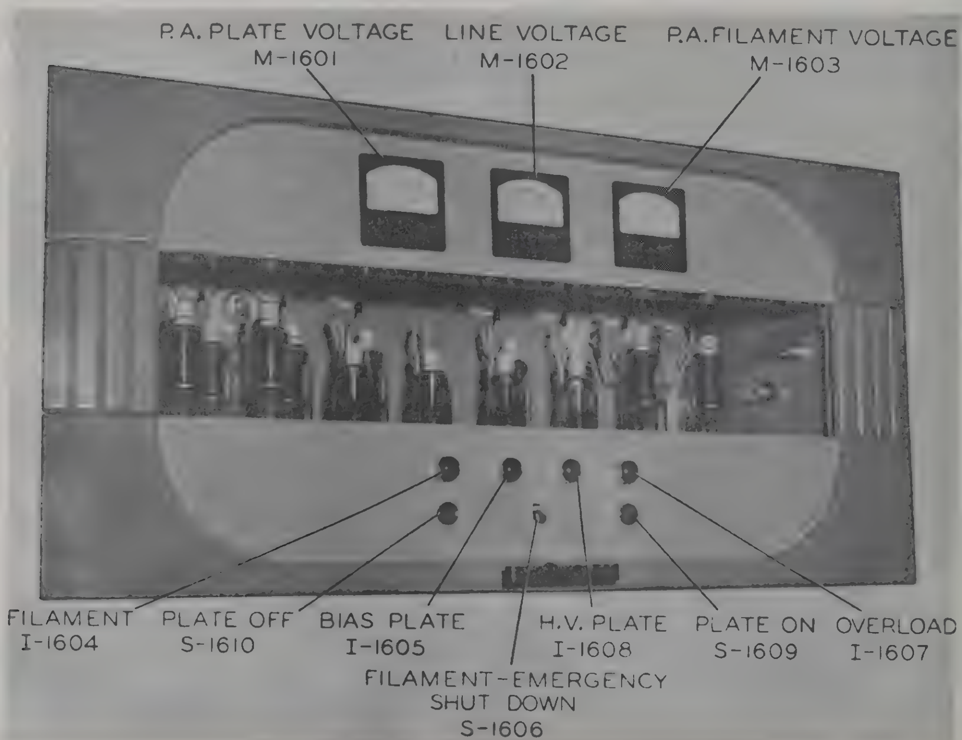


Figure 37. Upper Control Panel, Power Supply Assembly PP-1089/FRT-22 Controls.

Control	Function
PLATE OFF switch (S-1509)	Shuts off all plate voltages in the PA unit.
PLATE ON switch (S-1508)	Turns on all plate voltages in the transmitter.
FILAMENT - EMERGENCY SHUT DOWN switch (S-1506)	Turns on filament voltages in the PA and PA power supply. Interlocked with FILAMENT - EMERGENCY SHUT DOWN switches S-307, S-510, and S-1606, located on the IPA power supply, IPA, and PA power supply bays respectively. All must be in the ON position. Shuts off all voltages, plate and filament, in the PA unit and PA power supply.
D.C. TEST switch (S-1501)	Inserts DC TEST meter into the following circuits with the indicated meter ranges: L. grid -- 1.25 amp. R. grid -- 1.25 amp. L. cathode #1 -- 5.0 amp. L. cathode #2 -- 5.0 amp. L. cathode #3 -- 5.0 amp. R. cathode #1 -- 5.0 amp. R. cathode #2 -- 5.0 amp. R. cathode #3 -- 5.0 amp.
R.F. TEST switch (S-1502)	Inserts RF TEST meter in the following circuits with the indicated meter ranges: L. grid r-f peak -- 1000 v R. grid r-f peak -- 1000 v L. plate r-f peak -- 10 kv R. plate r-f peak -- 10 kv
TEST KEY lever-action switch (S-1503)	Applies test keying voltage to keyer when KEYING SELECTOR switch is in LOCAL position.
PLATE TUNING potentiometers (R-1572.1 -- R-1572.10)	Varies resonant frequency of V-1501 -- V-1506 plate tank circuit through servo system.
LOADING potentiometers (R-1573.1 -- R-1573.10)	Varies relative position of output coupling network to PA plate tank circuit through servo system.
ANTENNA TUNING potentiometers (R-1571.1 -- R-1571.10)	Varies the resonant frequency of output coupling network through servo system.
INPUT CAPACITY switches (S-1525.1 -- S-1525.10)	Controls cathode shunt capacity (12 steps) to maintain approximately constant input impedance throughout frequency range.
PLATE TANK SHORT switches (S-1526.1 -- S-1526.10)	Shorts out several turns of PA plate tank.

h. Power Supply Assembly PP-1089/FRT-22 (figs. 37 and 38).

Control	Function
P.A. PLATE VOLTAGE meter (M-1601)	Reads the high-voltage PA plate supply voltage.

Control	Function
LINE VOLTAGE meter (M-1602)	Reads any of the three regulated phase voltages. Switched by METER SWITCH (S-1621).
P.A. FILAMENT VOLTAGE meter (M-1603)	Reads left PA filament voltage or right PA filament voltage. Switched by METER SWITCH (S-1621).
FILAMENT lamp (I-1604), amber	Indicates filaments on in PA power supply bay when lighted.
BIAS PLATE lamp (I-1605), green	Indicates PA bias supply on when lighted.
H.V. PLATE lamp (I-1608), red	Indicates PA high-voltage plate supply on when lighted.
OVERLOAD lamp (I-1607), amber	Indicates that overload has occurred within the automatic restart interval.
PLATE OFF switch (S-1610)	Shuts off all plate voltages in the PA unit.
PLATE ON switch (S-1609)	Turns on all plate voltages in the transmitter.
FILAMENT - EMERGENCY SHUT DOWN switch (S-1606)	Turns on filament voltages in the PA and PA power supply. Interlocked with FILAMENT - EMERGENCY SHUT DOWN switches S-307, S-510, and S-1506, located on the IPA power supply, IPA, and PA bays respectively. All must be in the ON position. Shuts off all voltages, plate and filament, in the PA Unit and Power Supply.
METER SWITCH (S-1621)	Inserts LINE VOLTAGE and P.A. FILAMENT VOLTAGE meters into indicated positions. Provides switching to each of the regulated phases and to the PA filaments.
SERVO CONTROL circuit breaker (S-1607)	Controls application of 230 volts ac to servo power supply.
CONTROL CIRCUIT circuit breaker (S-1603)	Controls application of 230 volts ac to the relays and timers of the control circuit which control high-voltage and d-c bias.
BIAS circuit breaker (S-1602)	Controls application of 230 volts ac to primary windings of the bias supply plate transformer.
P.A. PLATE VOLTAGE switch (S-1622)	Adjusts output of hv plate transformer. Limit lamps indicate upper and lower limits.
LEFT P.A. FILAMENT rheostat (R-1639)	Adjusts PA filament voltage.
RECT. FILAMENT circuit breaker (S-1604)	Controls application of 230 volts ac to primaries of hv rectifiers.
P.A. FILAMENT circuit breaker (S-1605)	Controls application of 230 volts ac to primaries of the PA filament transformers.
BLOWER circuit breaker (S-1601)	Controls application of 230 volts ac to PA blowers.
RIGHT P.A. FILAMENT rheostat (R-1640)	Adjusts right PA filament voltage.

Control	Function
P.A. BIAS potentiometer (R-1638)	Adjusts bias on V-1501 through V-1506.
P.A. CONTROL switch (S-1608)	Permits disconnecting the power amplifier control circuits from the rest of the transmitter so that the intermediate power amplifier may be operated independently.
TEST KEY lever-action switch (S-1620)	Applies a test voltage to keyer when KEYING SELECTOR switch is in LOCAL position.

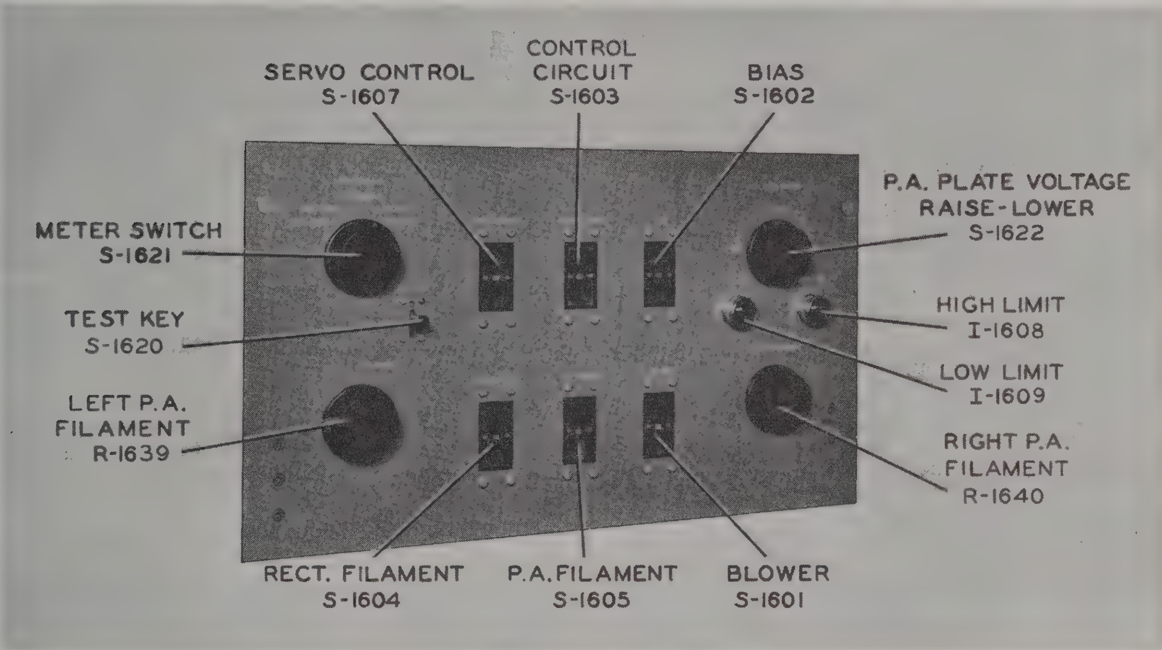


Figure 38. Lower Control Panel, Power Supply Assembly PP-1089/FRT-22 Controls.

Section III. OPERATION UNDER USUAL CONDITIONS

15. General

Since tuning this equipment involves a rather complex procedure, for purposes of explanation an arbitrary set of operating conditions will be assumed: that conventional "on-off" keying is to be used and that the transmitter frequency is to be 26,000 kc. It should be understood that the procedures set forth below will apply to actual operating conditions as well as to the example chosen. Tuning charts are included in this section to aid the operator in tuning and adjusting this transmitter. The operator is referred to Section II of this chapter for the explanation of panel designations, locations and functions.

16. Preliminary Starting Procedure

If the equipment has been aligned and tested according to the instructions in Section V, INITIAL ADJUSTMENTS, the preliminary starting procedure consists only of operating all power switches and circuit breakers to the OFF positions.

17. Procedure Using R-F Oscillator O-270/FRT-26

The tuning charts, figures 39 thru 49, provide initial or typical setting data. It should not be assumed that the transmitter being tuned will coincide exactly with these curves.

a. Operate circuit breakers SERVO CONTROL, S-306; CONTROL CIRCUIT, S-303; L.V. AND BIAS S-302; LOW LEVEL FILAMENT, S-304; P.A. FILAMENT, S-305; and BLOWER, S-301, on Power Supply Assembly PP-1088/FRT-26 to the ON position.

b. Operate circuit breakers SERVO CONTROL, S-1607; CONTROL CIRCUIT, S-1603; BIAS, S-1602;

RECT. FILAMENT, S-1604; P.A. FILAMENT, S-1605; and BLOWER, S-1601, on Power Supply Assembly PP-1089/FRT-22 to the ON position.

c. Connect the output of R-F Oscillator O-270/FRT-26 to the transmitter input. This is accomplished by attaching one end of one of the short lengths of RG-58/U coaxial cable to J-1202, CRYSTAL OSC. OUTPUT, on the patch panel, and the other end of the cable to J-1201, TRANSMITTER INPUT, on the patch panel.

d. Operate the FILAMENT - EMERGENCY SHUT DOWN switches on all four cabinets to the ON position.

e. Turn the TUNE-OPERATE switch to the L.V. TUNE position.

f. Set the channel selector switch to the desired position. In this case, the desired output frequency is 26.0 mc; hence, a 3,250 kc crystal should be used for the selected channel.

Note. Multiplication factors of 2, 4, 6 or 8 may be used (see fig. 39). However, the oscillator frequency should be between 2.0 and 4.0 mc.

g. Refer to the calibration curves, figs. 39 through 47, and set up controls [A], [B], [C], [D], [E], [F], and [G], on the control panel of Radio Transmitter T-454/FRT-26 and [H] and [M] on the control panel of R-F Amplifier AM-738/FRT-22 to the settings indicated by the curves. In this example, the frequency is being multiplied by four in the first multiplier and by two in the second multiplier, resulting in a total multiplication of eight. Setting for controls [I] and [J] on the control panel of R-F Amplifier AM-738/FRT-22 will depend on the nature of the load presented to the transmitter by the transmission line.

h. Check the position of shorting switches [G] and [N]. For frequencies below approximately 10 mc both should be open and for frequencies above approximately 10 mc both switches should be closed.

i. Operate any one of the four TEST KEY controls to the upper, or locking position.

j. Set the KEYING SELECTOR switch, S-501, on Radio Transmitter T-454/FRT-26 to the LOCAL position.

k. Rotate the EXCITER TEST switch, S-503, to position 1.

(1) BUFFER CATHODE - 100 ma.

(2) 1st MULTIPLIER GRID - 10 ma. The EXCITER TEST NO. 1 meter indicates the buffer cathode current and the EXCITER TEST NO. 2 meter indicates the first multiplier grid current.

l. Press the PLATE ON button, S-519, on the upper door of Radio Transmitter T-454/FRT-26 or Power Supply Assembly PP-1088/FRT-26. Check the reading on EXCITER TEST meter NO. 1, M-505, and EXCITER TEST meter NO. 2, M-506.

Note. Check the meter readings obtained against the typical readings given (par. 24). Minor variations from the readings given are to be expected.

m. Rotate the EXCITER TEST switch, S-503, to position 2.

(1) 1st MULTIPLIER CATHODE - 100 ma.

(2) 2nd MULTIPLIER GRID - 10 ma.

n. Tune [A], 1st MULTIPLIER PLATE TUNING, for maximum reading of EXCITER TEST NO. 2. This meter indicates the second multiplier grid current.

o. Rotate the EXCITER TEST switch, S-503, to position 3.

(1) 2nd MULTIPLIER CATHODE - 200 ma.

(2) DRIVER GRID - 50 ma.

p. Tune [B], 2nd MULTIPLIER PLATE TUNING, for maximum reading on DRIVER GRID meter. If there is no indication on EXCITER TEST NO. 2, check control [L] and set for center of tuning range.

q. Rotate the EXCITER TEST switch, S-503, to position 4.

(1) L.P.A. GRID RF PEAK - 1000 V.

(2) L.P.A. PLATE RF PEAK - 10 kv.

r. Tune [C], DRIVER PLATE TUNING, for

maximum indication on EXCITER TEST NO. 1 meter. This tunes the driver plate nearly to resonance.

s. Rotate the P.A. TEST switch, S-504, to the TOTAL P.A. GRID - 1.0A position. This total IPA grid current is indicated on the P.A. TEST meter, M-507.

t. Rotate the TUNE-OPERATE switch, S-310, to the H.V. TUNE position.

Note. As soon as the TUNE-OPERATE switch is turned to the H.V. TUNE position, the power amplifier plate tuning control (IPA plate) should be adjusted for minimum plate current to prevent damage to the intermediate power amplifier tubes.

u. Recheck the DRIVER PLATE TUNING control C to make certain that it is adjusted to produce maximum IPA grid current and, at the same time, minimum driver cathode current. Check the driver for proper neutralization by carefully noting that as the DRIVER PLATE TUNING is varied through resonance the driver grid current and the IPA grid current reach their respective peaks simultaneously. If this is not the case, recheck the driver neutralization by the procedure outlined in paragraph 69 o.

v. Check the intermediate power amplifier for neutralization. This is accomplished by tuning the POWER AMP. PLATE TUNING control on Radio Transmitter T-454/FRT-26 and observing the grid current and the plate current. If the stage is neutralized the plate current will reach the minimum at the same time that the grid current reaches its maximum. If this does not occur, the stage needs neutralization. Refer to paragraph 69 p. for the correct procedure for neutralizing the intermediate power amplifier.

Note. The left and right intermediate power amplifier grid and cathode currents should have been balanced at approximately 20 mc during installation of the equipment. The IPA cathode currents should remain fairly well balanced throughout the frequency range of the transmitter. If not they should be checked in accordance with the procedure in paragraph 69 p. (15). The grid currents, however, probably will not remain balanced over the entire frequency range. A difference of up to 110 ma between the left and the right IPA grid currents at the lower frequencies is not abnormal provided that they are balanced at approximately 20 mc.

w. Operate the TUNE-OPERATE switch to the OPERATE position, and immediately readjust the intermediate POWER AMP. PLATE TUNING control D for minimum plate current.

x. Operate F, the intermediate power amplifier ANT. TUNING control, until a noticeable indrease occurs in the IPA plate current. Adjust F for the maximum of this peak; simultaneously, or in alternate steps, readjust D for minimum. At the same time, watch the power amplifier TOTAL GRID CURRENT meter, M-1503, and do not allow the PA grid current to exceed 2.5 amperes. Increase or decrease the intermediate POWER AMP. LOADING control E as necessary to keep the PA grid current between 1.5 and 2.5 amp.

Note. If the equipment is being tuned to a new, uncharted frequency, or if an operator with no previous experience at tuning this equipment is doing so, it is advisable to turn the power amplifier plate voltage control for minimum voltage. This is done by turning the P.A. PLATE VOLTAGE control switch counterclockwise, to the LOWER position, and holding it in this position until the green LOW LIMIT lamp lights.

y. Depress one of the PLATE ON switches on R-F Amplifier AM-738/FRT-22 and Power Supply Assembly PP-1089/FRT-22, and when the high voltage is applied, immediately tune the power amplifier PLATE TUNING control H for minimum plate current indication on TOTAL PLATE CURRENT meter M-1501.

z. Set LOADING control I between 0 and 200 on the dial.

aa. Tune the ANTENNA TUNING control J for a noticeable rise in current indication on TOTAL PLATE CURRENT meter M-1501. Adjust J carefully for the maximum of this peak; simultaneously, trim up the PLATE TUNING control H for minimum plate current. Adjust LOADING control I as necessary to get a clear-cut indication with the other two.

ab. Bring the PA plate voltage up to 5500 volts by turning the P.A. PLATE VOLTAGE control clockwise and holding it until the reading on P.A. PLATE VOLTAGE meter M-1601 reaches the desired reading.

ac. Increase LOADING until TOTAL PLATE CURRENT meter M-1501 reads approximately 7 amperes. At the same time, adjust the intermediate POWER AMP. LOADING to keep the TOTAL GRID CURRENT reading between 1.5 and 2 amp. Check the IPA grid current on intermediate P.A. TEST meter M-507 during this process; it should not fall below 0.3 amp.

ad. Recheck the intermediate ANT. TUNING, POWER AMP. PLATE TUNING, and DRIVER PLATE TUNING for resonance, and make small adjustments in the R.F. EXCITATION control if necessary to maintain the IPA total grid current between 0.3 and 0.5 amperes.

ae. Bring the power amplifier LOADING up to the desired power level, retrimming the intermediate POWER AMP. LOADING as necessary to maintain the PA grid current.

af. Readjust with the P.A. PLATE VOLTAGE control for 5.5 kilovolts, and again check loading. If the load presented to the transmitter by the transmission line is lower than 600 ohms and the operating frequency is 4000 kc or slightly higher, it may not be possible to increase the loading enough to produce the desired power output. If this is the case, insert either the 100-uuf or the 250-uuf fixed vacuum capacitor (which will be found in dummy mounting clips at the rear of the power amplifier chassis in R-F Amplifier AM-738/FRT-22 into the clips designated C-1587, located directly behind the variable vacuum antenna tuning capacitor C-1532, and try again.

ag. Carefully recheck all tuning controls to make certain that all are as accurately set as possible. Make only small movements of the controls, as some of them will be extremely sensitive to adjustment. If the intermediate POWER AMP. PLATE TUNING or power amplifier PLATE TUNING controls are shifted too far, the plate current may rise to sufficiently high values to trip one of the overloads. In this event, operate the TUNE-OPERATE switch to H.V. TUNE and retune the plate circuits to resonance, then return the TUNE-OPERATE switch to OPERATE position and proceed.

ah. Check the transmitter for stability by operating the TEST KEY several times. With this TEST KEY in center position, all r-f tube currents should drop to very low values. If they do not drop as they should, it is an indication of oscillation in one of the stages, probably resulting from improper neutralization. If the neutralization is good, and the oscillation still persists, a slight detuning of the 2nd MULTIPLIER PLATE TUNING control will completely eliminate it.

ai. With the transmitter tuned and loaded as indicated above, switch the KEYING SELECTOR to the REMOTE position and proceed with transmission in the normal manner using on-off keying.

18. Procedure Using R-F Oscillator O-91/FRT-5

The above procedure assumed crystal control. If it is desired to use R-F Oscillator O-91/FRT-5 for frequency control, it will be necessary first to connect its output to the transmitter input. This is accomplished by use of the patch panel and one of the type RG-58/U jumper cables furnished with the equipment (fig. 18). One end of this jumper cable must be connected to the MASTER OSCILLATOR OUTPUT, (J-1203), on the patch panel, and the other end of this jumper cable must be connected to the TRANSMITTER INPUT (J-1201). It will also be necessary to perform the following steps prior to performing the procedure given in paragraph 17 above.

a. Setting up on a Frequency Not Previously Recorded.

(1) Insert headphone plug into jack on front panel of the oscillator unit.

(2) Set SET UP - OPERATE switch to OPERATE position.

(3) Choose an oscillator frequency lying between 2.0 and 4.0 megacycles which, when multiplied by 2, 4, 6, or 8, will produce the exact desired output frequency. Figure 39 can be used as an aid in selecting this frequency and multiplying factor. However, actual longhand division of the exact output frequency by the multiplication factor should be done to derive the exact oscillator frequency.

(4) Set OUTPUT TUNING control $\boxed{C1}$ to the frequency determined in step (3).

(5) The frequency control circuit provides a check point every 5 kc at the output frequency. Set the INTERPOLATION OSCILLATOR control $\boxed{B1}$ to indicate the exact difference between the desired frequency and the check point just below it. For example, a required frequency of 2866.375 kc is 1375 cycles above the nearest check point; so the outer dial of $\boxed{B1}$ should be set to 1.3 and the inner dial to 75.

(6) Set the MASTER OSCILLATOR CONTROL $\boxed{A1}$ as close as possible to the required

frequency. In the example just given above, set the outer dial to 2.8 and the inner dial to 66.

(7) At this point, a steady tone should be audible in the headphones.

(8) Readjust the MASTER OSCILLATOR control $\boxed{A1}$ until a low pitched tone (50 to 100 cps) is heard in the headphones.

(9) This tone should be made as loud and as clear as possible by slight readjustment of the OUTPUT TUNING control $\boxed{C1}$

(10) Remove the headphone plug.

(11) Record the dial readings of each control for this frequency for future reference.

(12) Refer to the foregoing procedure and follow steps 17 g. through 17 ai. to complete tuning of the transmitter.

b. Setting up on a Frequency Previously Recorded on Tuning Charts.

(1) Throw the SET-UP-OPERATE switch on R-F Oscillator O-91/FRT-5 to the SET UP position.

(2) Set MASTER OSCILLATOR control $\boxed{A1}$ to the setting previously recorded for that control.

(3) Set the INTERPOLATION OSCILLATOR $\boxed{B1}$ to the setting previously recorded for that control.

(4) Set the OUTPUT TUNING, control $\boxed{C1}$, to the setting previously recorded for that control.

(5) Turn the SET UP - OPERATE switch on R-F Oscillator O-91/FRT-5 to OPERATE.

(6) Refer to the preceding procedure, paragraph 17, and follow steps g. through ai. to complete tuning of the equipment.

19. Procedure Using Frequency Shift Keyer KY-45/FRT-5

Whether this keyer is in use or not, keep a-c power connected to the oven to maintain correct operating temperatures. In order to use the keyer it will be necessary to provide it with an r-f carrier from some external source and to connect its output to the transmitter input. These two requirements are fulfilled by use of the patch panel and two jumper cables (fig. 18). Connect one end of the cables to either the EXTERNAL (J-1208), CRYSTAL OSCILLATOR OUTPUT (J-1202) or MASTER OSCILLATOR OUTPUT (J-1203) jacks, depending upon which one is to be used to provide the r-f carrier for the keyer. Connect the other end of the jumper cable to the F.S. KEYER EXT. INPUT (J-1205). Connect another jumper cable from F.S. KEYER OUTPUT (J-1204) to TRANSMITTER INPUT (J-1201).

Note. The r-f carrier which is provided to the keyer must be 200 kc higher than the desired keyer output (input to the transmitter). Since the transmitter has provision for multiplication by factors of 2, 4, 6 and 8, this will have to be considered when choosing a transmitter input for a desired transmitter output frequency.

a. Setting of Controls.

(1) Set operating control MAIN TUNING $\boxed{A2}$ to the output frequency of the keyer as determined above. This is equal to the transmitter output frequency divided by the particular multiplying factor at which the transmitter is operating. Set the TRANSMITTER MULTIPLICATION $\boxed{B2}$ on the keyer to the same multiplying factor. Provision is not made to operate the keyer with a transmitter multiplying factor of 6, but if it is necessary to do so, the required shift may be obtained by using the BASIC SHIFT control. Merely adjust the BASIC SHIFT to a point where the shift at the keyer is equal to the desired final shift divided by the transmitter multiplication factor.

(2) Turn the METER SWITCH to the GRID position.

(3) Turn the OUTPUT LEVEL control to full output (position 10).

(4) Readjust the MAIN TUNING CONTROL $\boxed{A2}$ slightly until maximum grid current indication is obtained on the power amplifier.

(5) Turn the METER 807 switch to the PLATE position. Average indication should be about 60 ma.

b. Frequency Check.

(1) Set TEST-OPERATE switch to CARRIER position.

(2) Tune a receiver to the transmitter frequency.

(3) Adjust the r-f measuring equipment to the transmitter output frequency.

(4) Adjust the 200-kc OSCILLATOR ADJUST until a zero-beat condition is obtained between the r-f measuring equipment and the transmitter output.

c. Frequency Shift Adjustment.

(1) Set the TEST-OPERATE switch to the CARRIER position.

(2) Using a receiver as a mixer, beat an accurate external frequency standard, set at the transmitter output frequency, against the keyer output. Assuming the keyer is exactly on a subharmonic of the carrier frequency, a zero beat will be obtained in the receiver.

(3) Set the TRANSMITTER MULTIPLICATION B2 switch to the position indicating the desired transmitter multiplication factor.

(4) Connect the output of an audio oscillator to the receiver audio system and adjust the audio oscillator for a frequency corresponding to one-half the final shift required.

(5) Set TEST-OPERATE switch to the SPACE position.

(6) Compare the audio output of the receiver mixer with the audio oscillator and adjust the BASIC SHIFT until the two audio frequencies produce a zero beat.

(7) Set the TEST-OPERATE switch to the MARK position and check that a near zero beat is also produced in this position.

(8) Refer to steps 17 g. through 17 ai. to complete the transmitter tuning procedure.

20. Tuning Procedure for Single-Sideband Operation

With the single sideband modification complete, as described in paragraph 34, and the input coaxial cables connected to the output of the Western Electric D156,000 or other suitable transmitter, the following tuning and setup procedure should be followed: Refer to the tuning charts, figures 39 through 49, for initial settings of all tuning controls for the frequencies to be used.

a. Connect the output of the single-sideband equipment that is to be used to drive the AN/FRT-22 transmitter to one of the SSB inputs in the IPA unit. These input jacks are located on the rear wall of the grid enclosure, accessible through the rear doors of the IPA bay. Assure that input plug P-532 is seated in the proper position in its socket, J-532, inside the grid enclosure. These are accessible from the front of the transmitter, by removing the front cover plate from the grid enclosure. Figure 183 shows the location of P-532 and J-532. If a 52-ohm unbalanced source is used to drive the transmitter, the plug must be inserted in the front position; if a 200-ohm balanced source is to be used, it must be inserted in the rear pair of contacts.

b. Operate circuit breakers SERVO CONTROL (S-306), CONTROL CIRCUIT (S-303), L.V. AND BIAS (S-302), LOW LEVEL FILAMENT (S-304), P.A. FILAMENT (S-305), and BLOWER (S-301) on Power Supply Assembly PP-1088/FRT-26 to the ON position. Operate circuit breakers SERVO CONTROL (S-1607), CONTROL CIRCUIT (S-1603), BIAS (S-1602), RECT. FILAMENT (S-1604), P.A. FILAMENT (S-1605), and BLOWER (S-1601) on Power Supply Assembly PP-1089/FRT-22 to the ON position.

c. Operate the FILAMENT - EMERGENCY SHUT DOWN switches on all four cabinets to the ON position.

d. Turn the TUNE-OPERATE switch to the L.V. TUNE position.

e. Set the channel selector switch to the desired position.

f. Refer to the calibration curves, figures 42 through 49, and set up controls C, D, E, F, and G, on the preset tuning control panel strip for the channel selected on Radio Transmitter T-454/FRT-26, and H and M on the preset tuning control panel strip corresponding on R-F Amplifier AM-738/FRT-22, to the settings indicated by the curves. Settings for the controls I and J on the preset tuning control panel strip of R-F Amplifier AM-738/FRT-22 will depend on the nature of the load presented to the transmitter by the transmission line.

g. Operate any one of the four TEST KEYS to the upper, locking position.

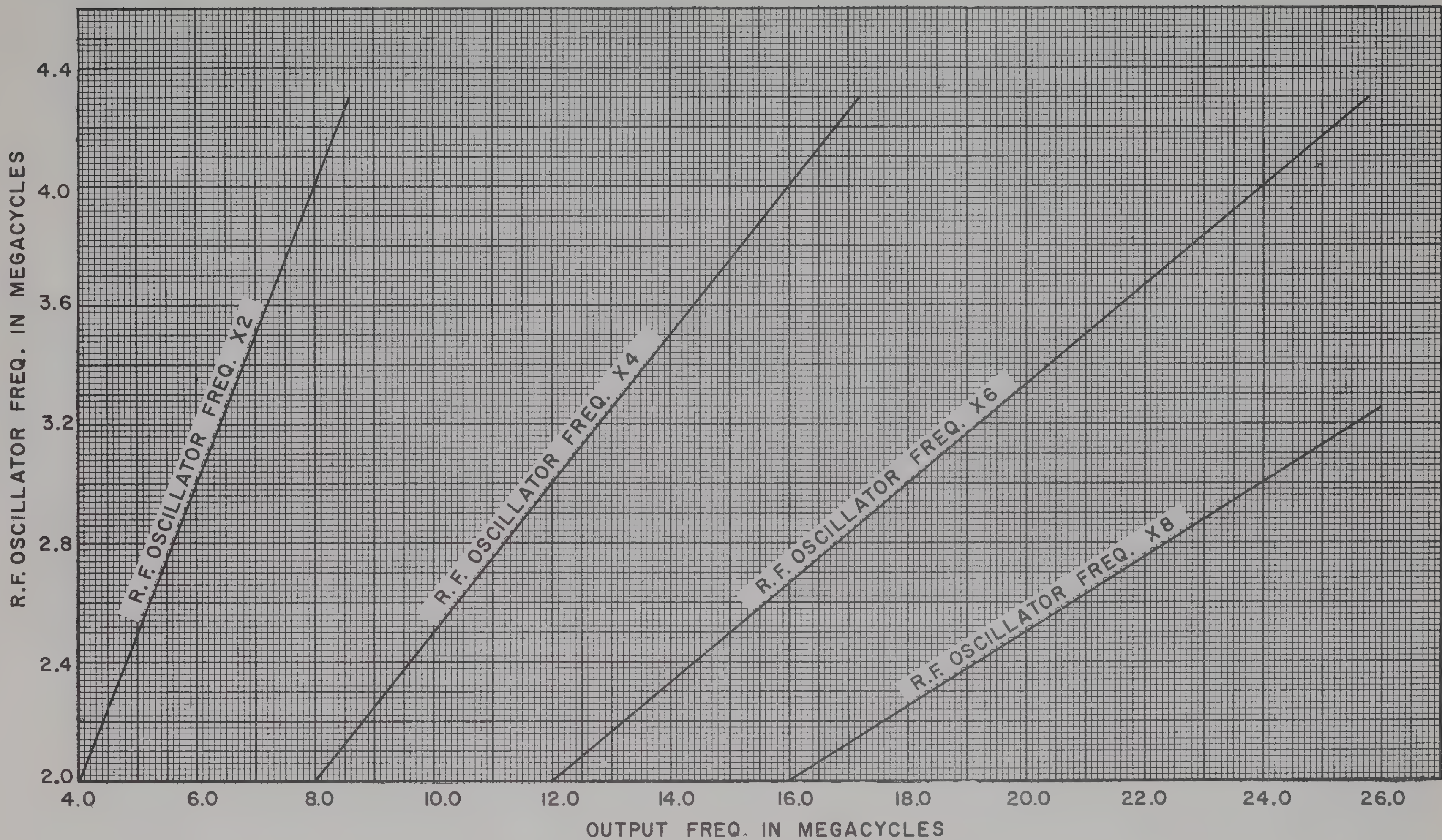


Figure 39. Oscillator Output Frequency vs. Transmitter Output Frequency.

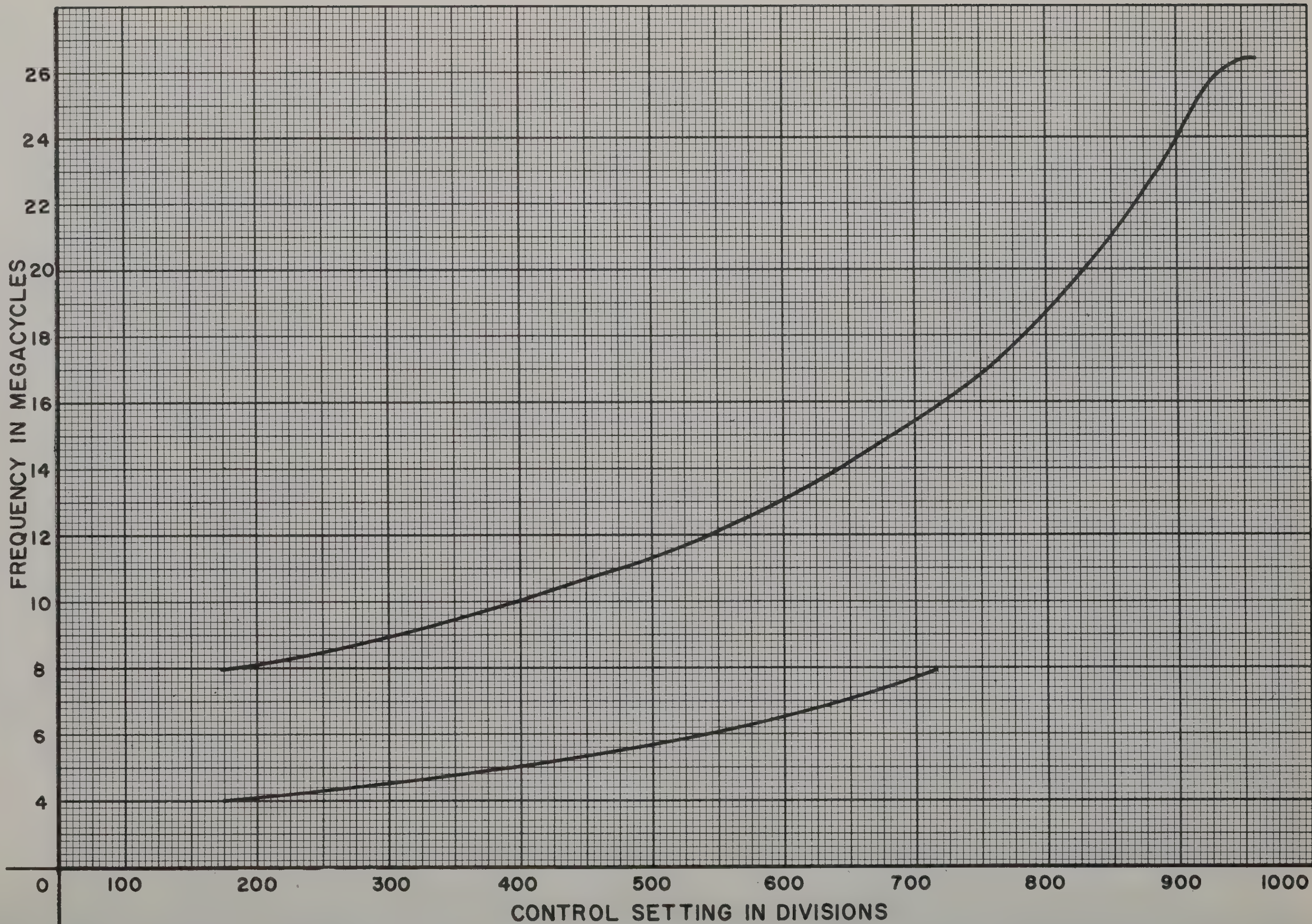


Figure 40. Transmitter Output Frequency vs. 1st MULTIPLIER PLATE TUNING Dial Indication.

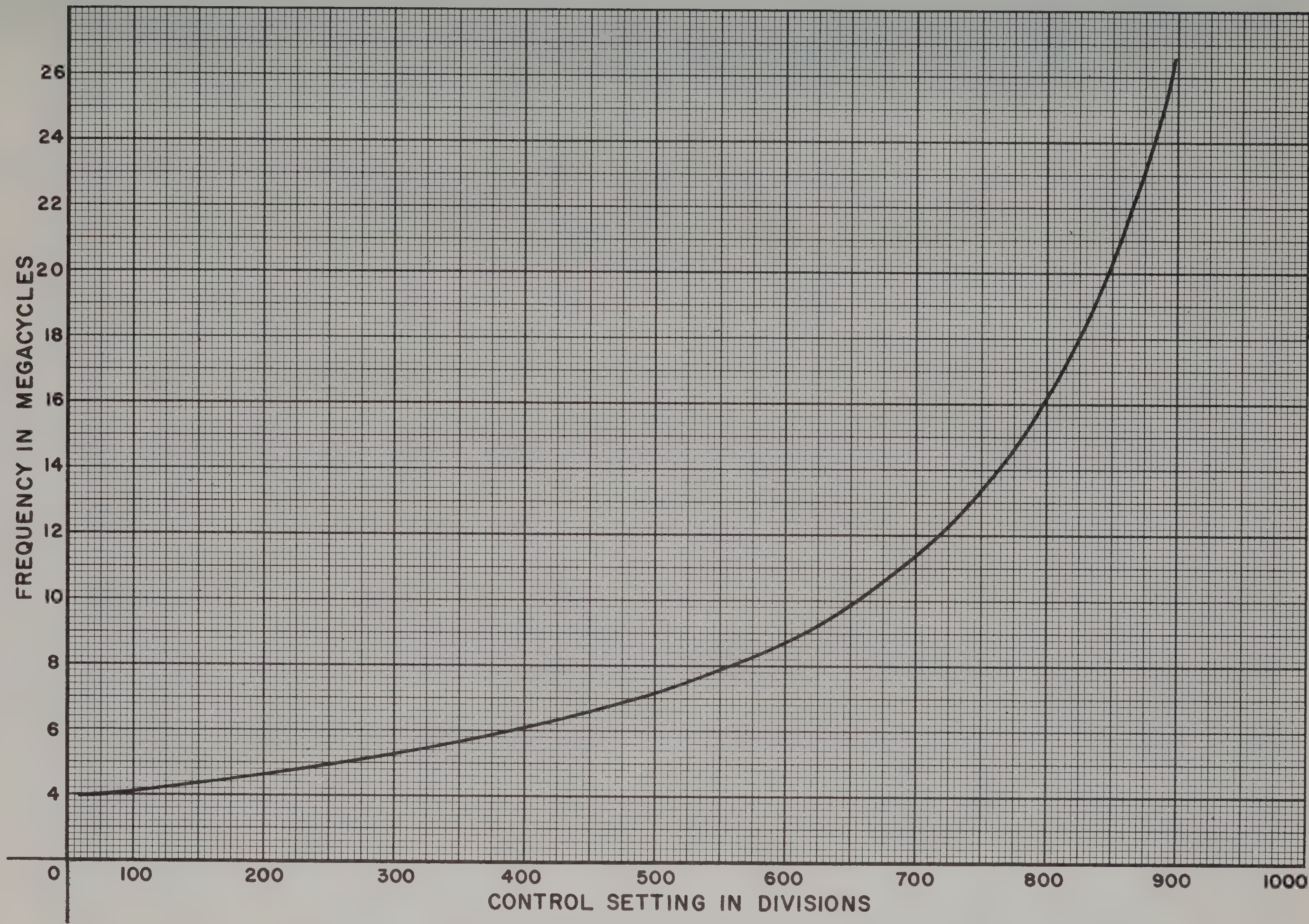


Figure 41. Transmitter Output Frequency vs. 2nd MULTIPLIER PLATE TUNING Dial Indication.

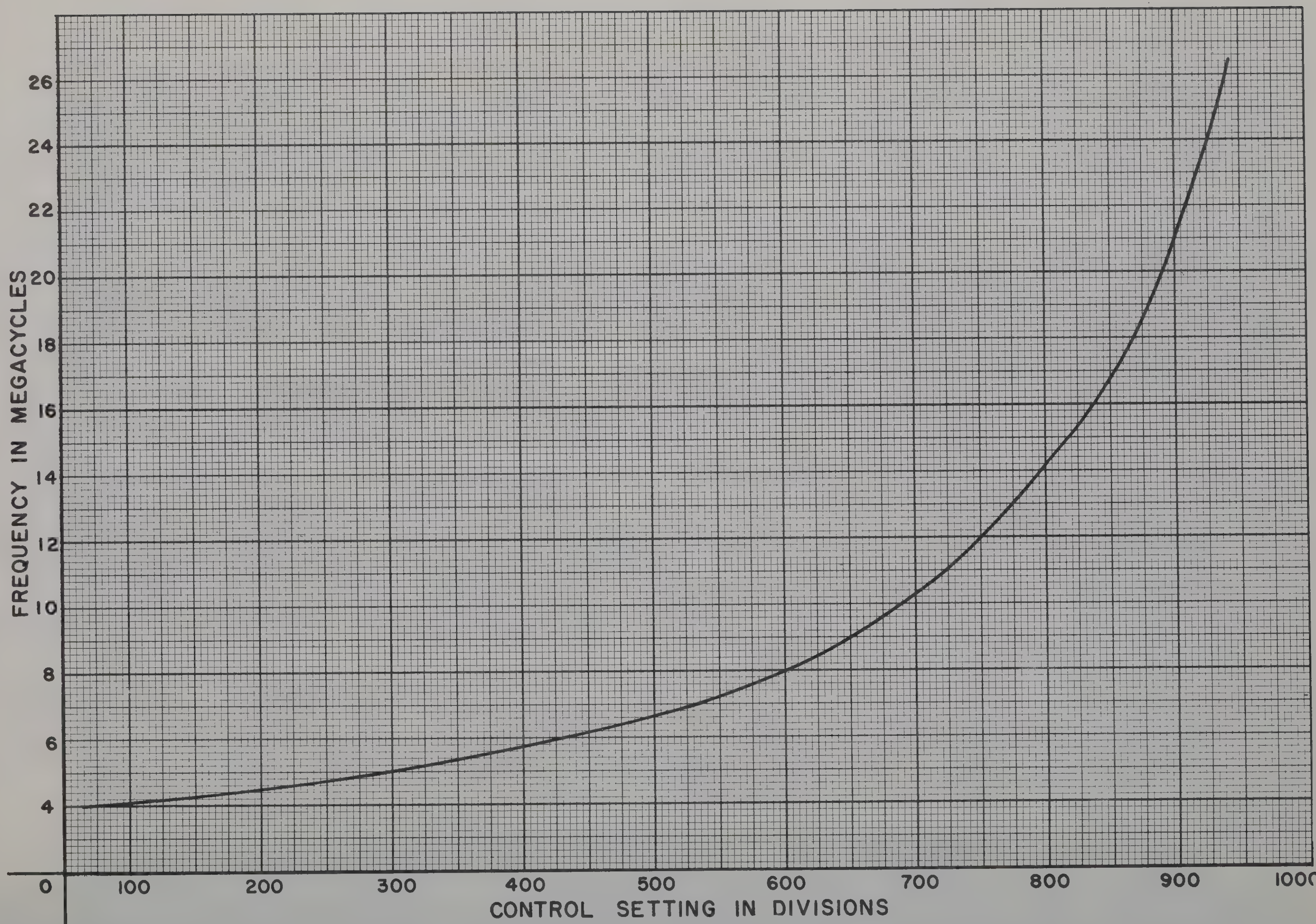


Figure 42. Output Frequency vs. DRIVER PLATE TUNING Dial Indication.

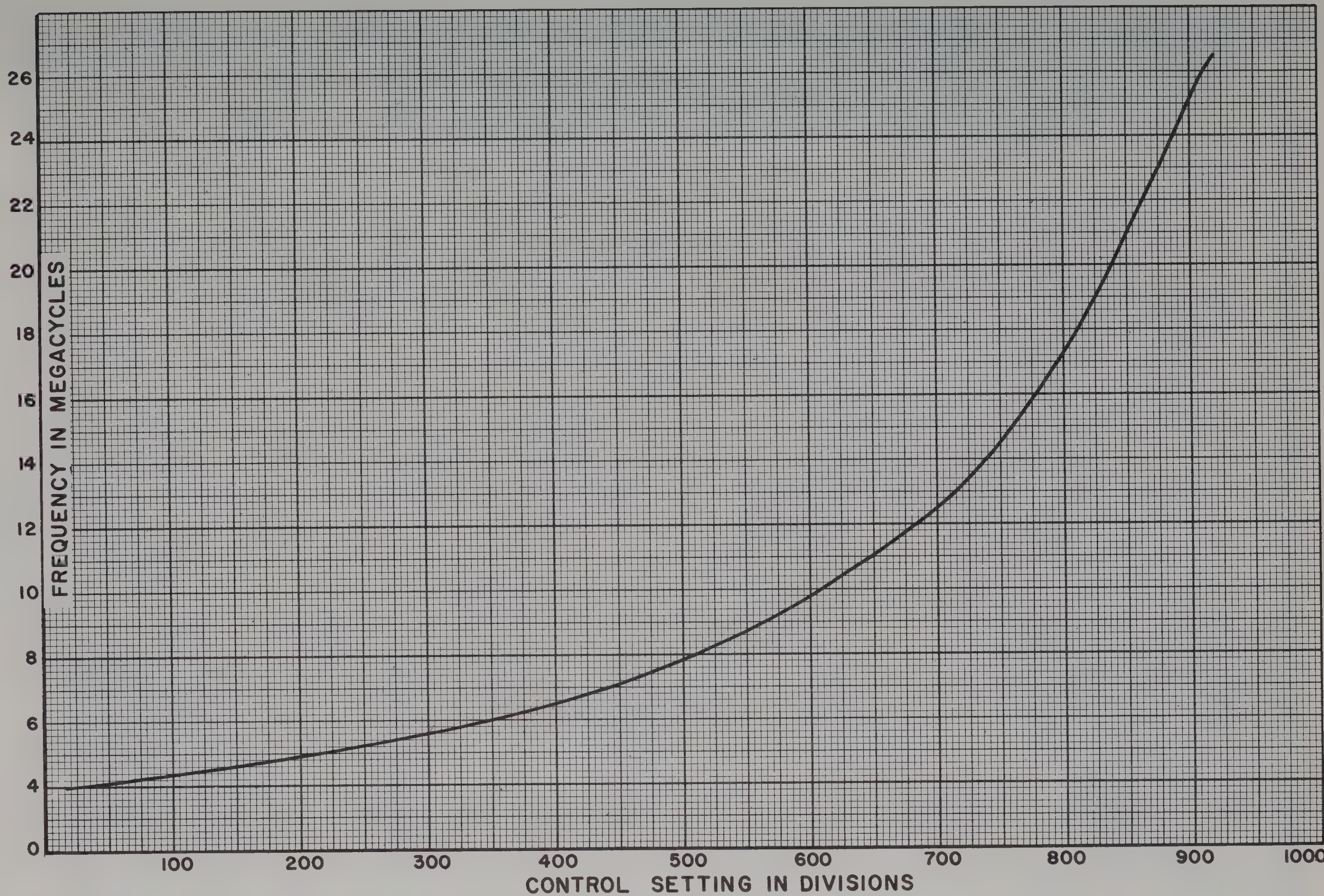


Figure 43. Output Frequency vs. Intermediate POWER AMPLIFIER PLATE TUNING Dial Indication.

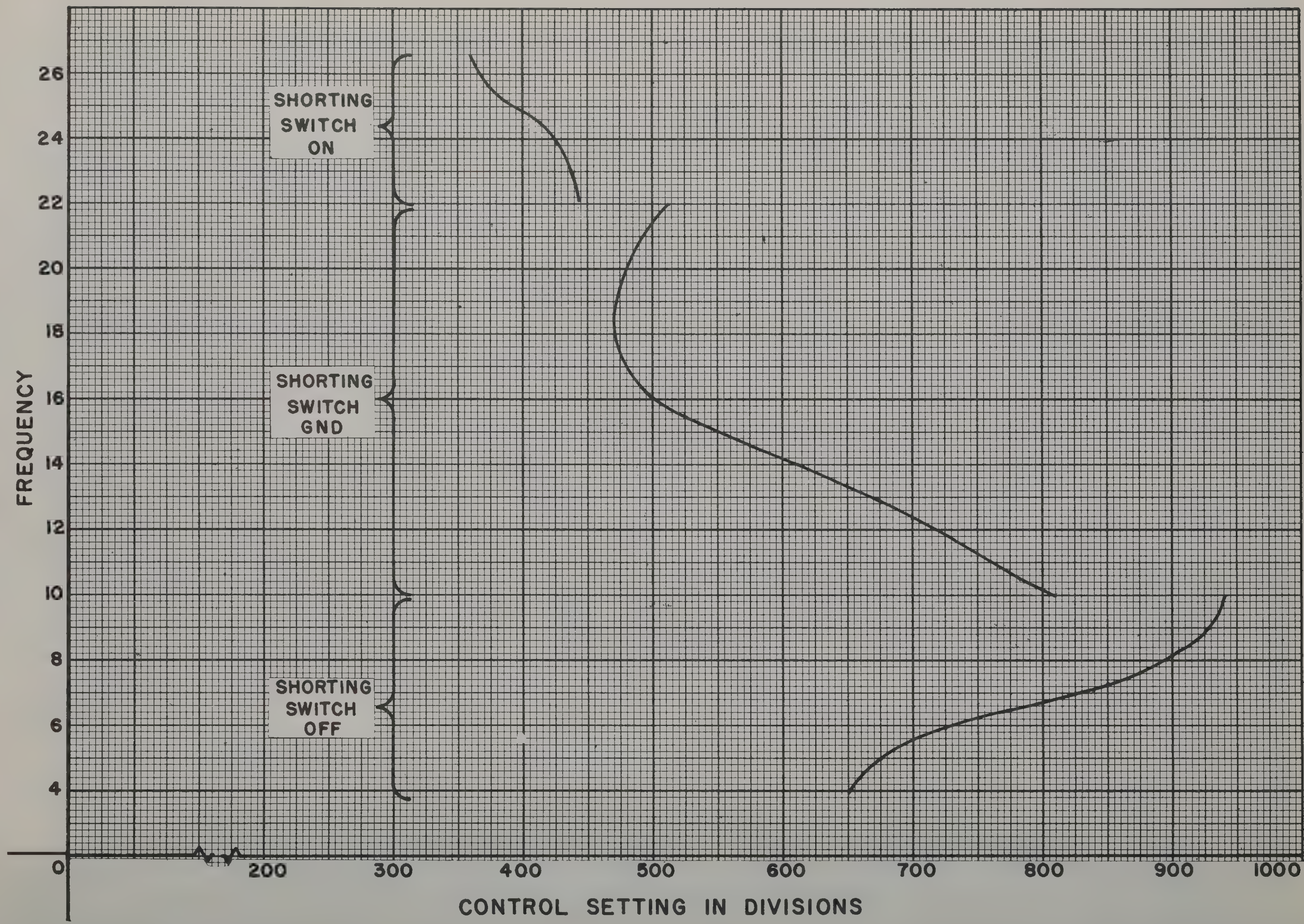


Figure 44. Output Frequency vs. Intermediate POWER AMPLIFIER LOADING Dial Indication.

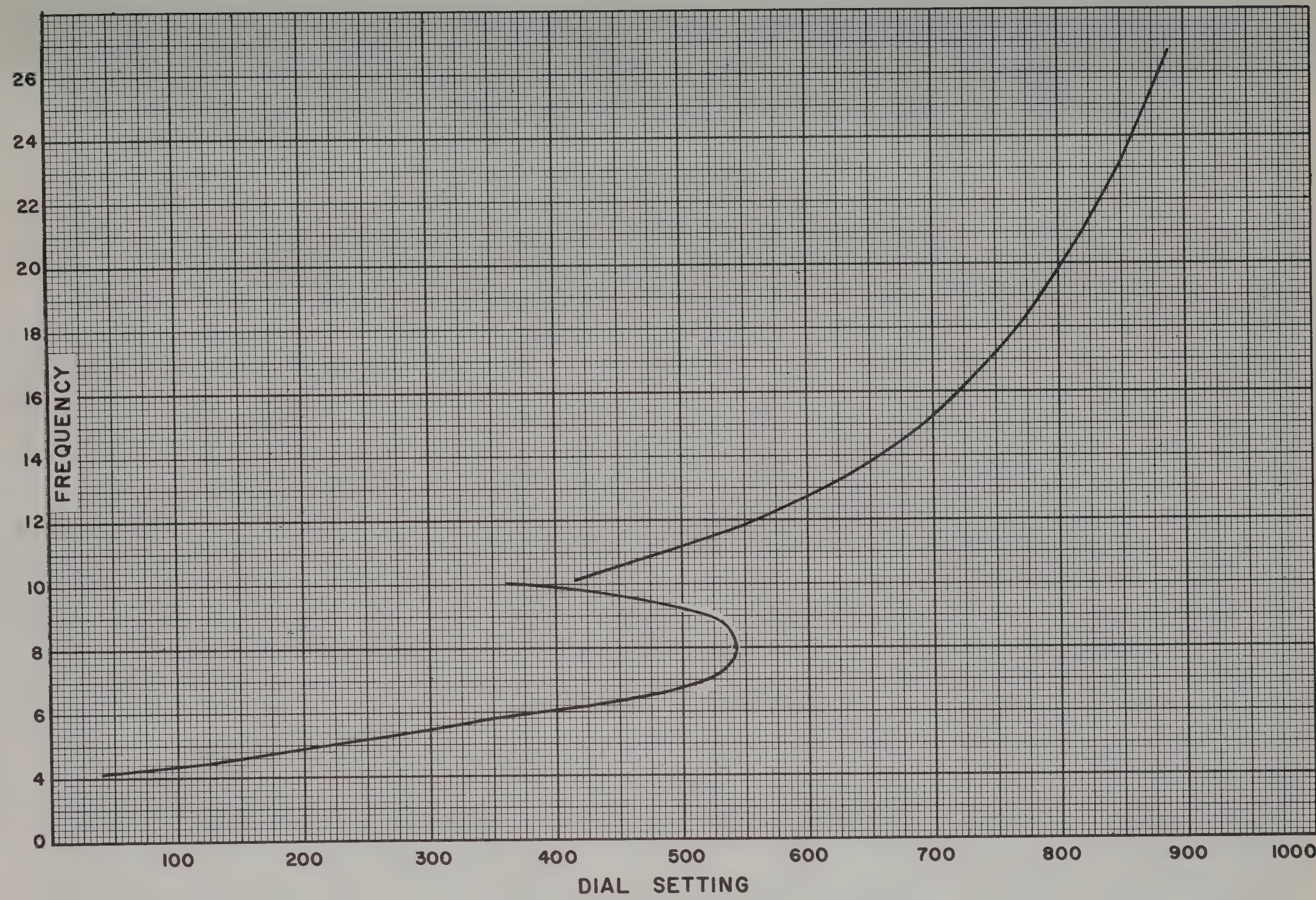


Figure 45. Output Frequency vs. (IPA) ANTENNA TUNING Dial Indication.

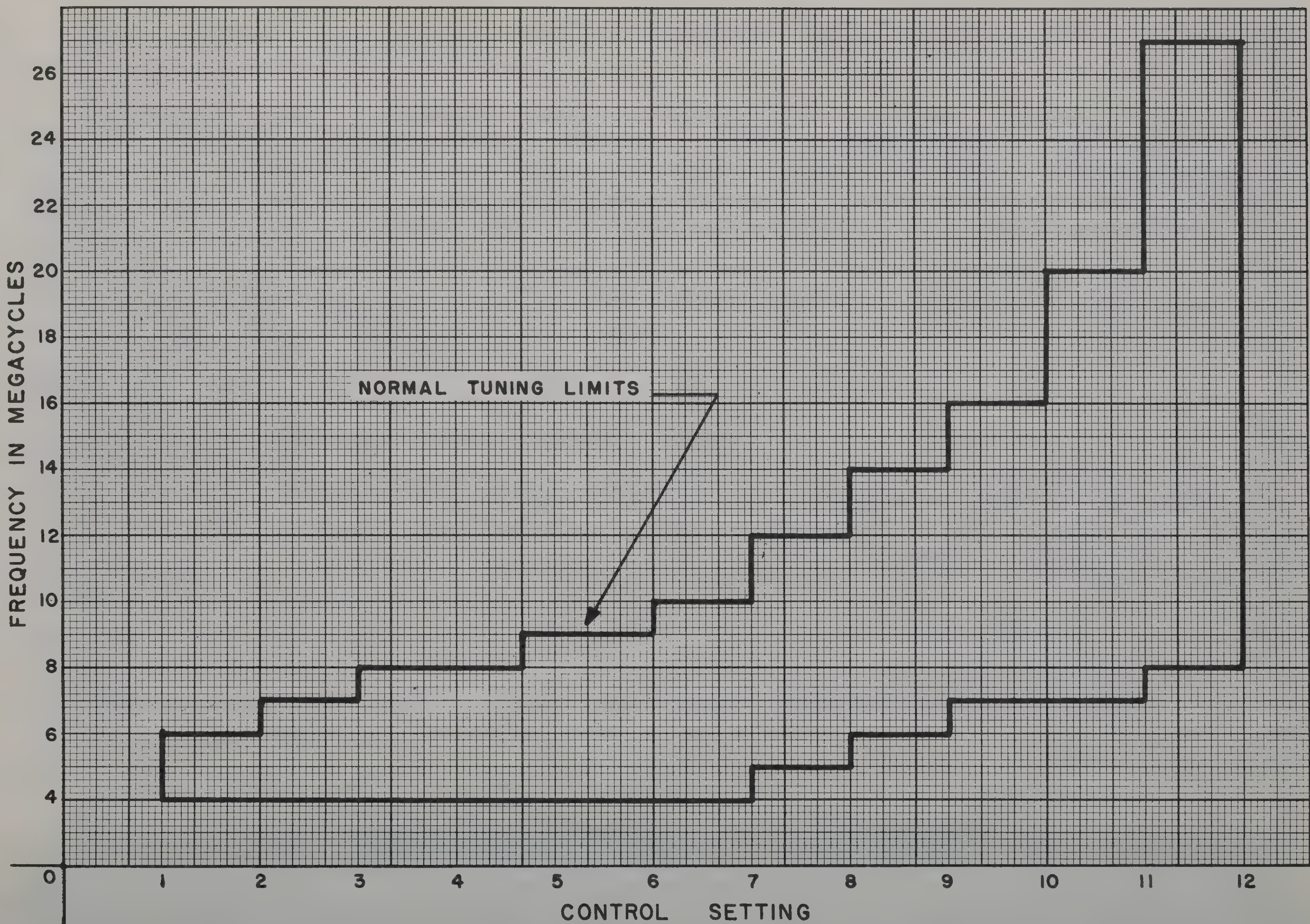


Figure 46. Output Frequency vs. PA INPUT CAPACITY Switch Position.

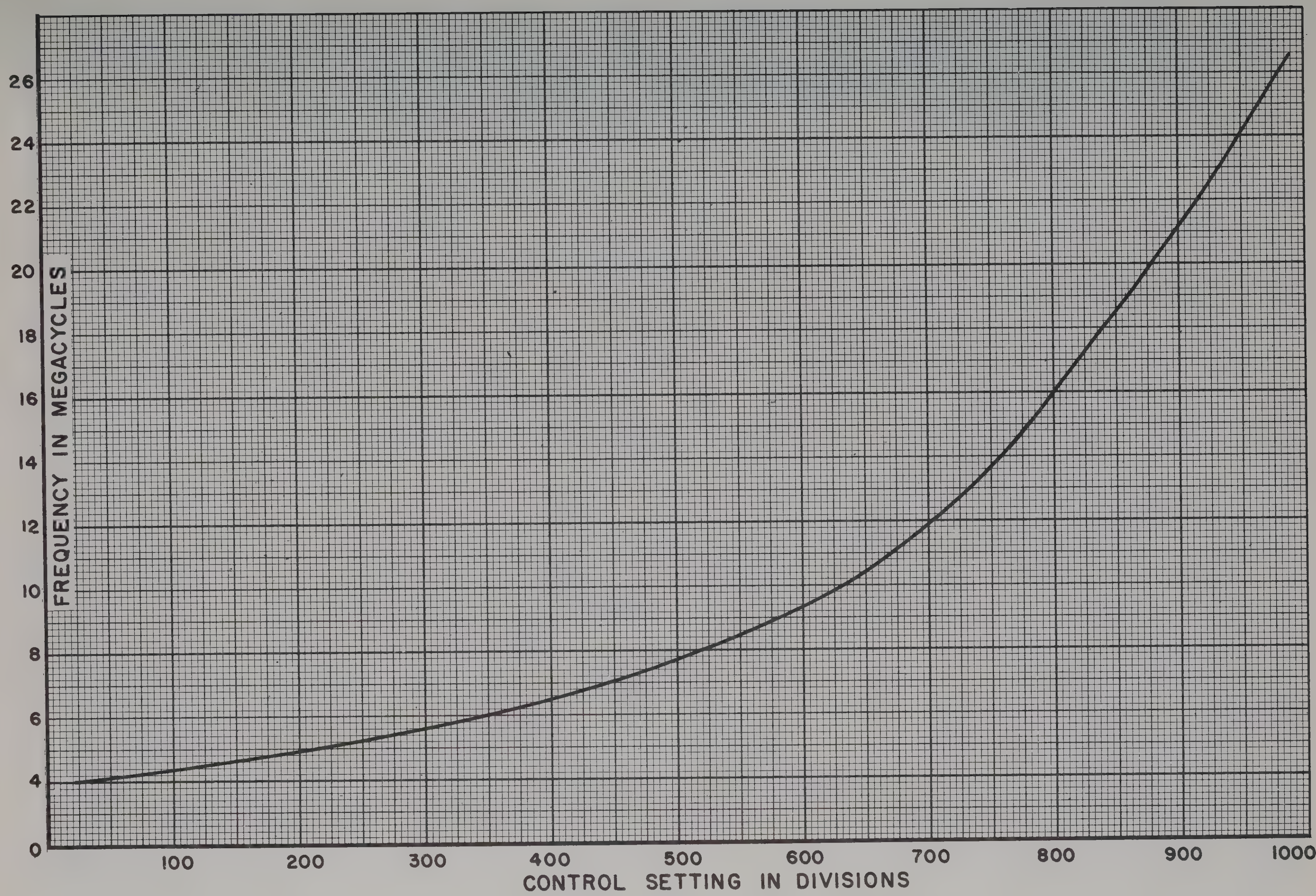


Figure 47. Output Frequency vs. PA PLATE TUNING Dial Indication.

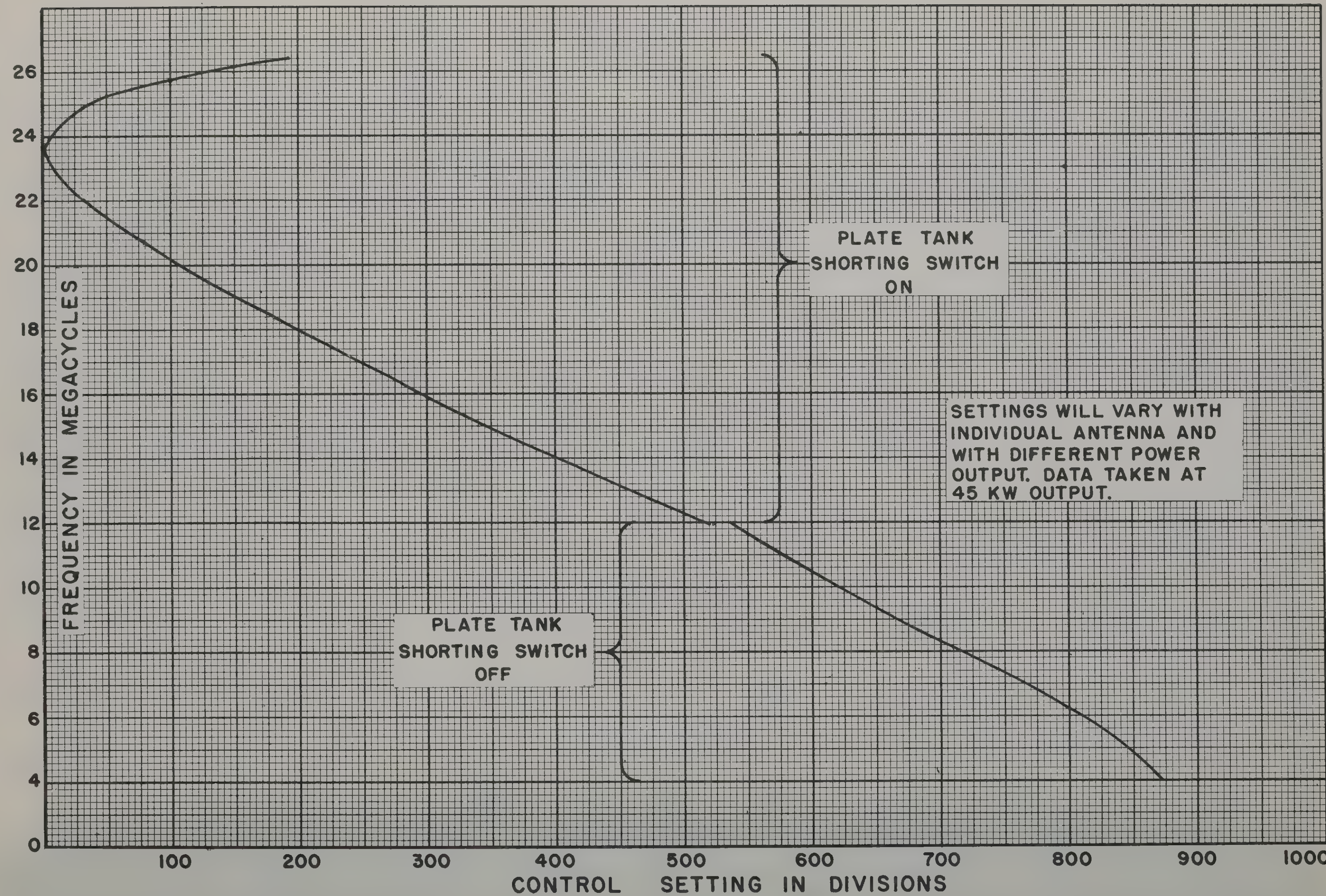


Figure 48. Output Frequency vs. PA LOADING Dial Indication.

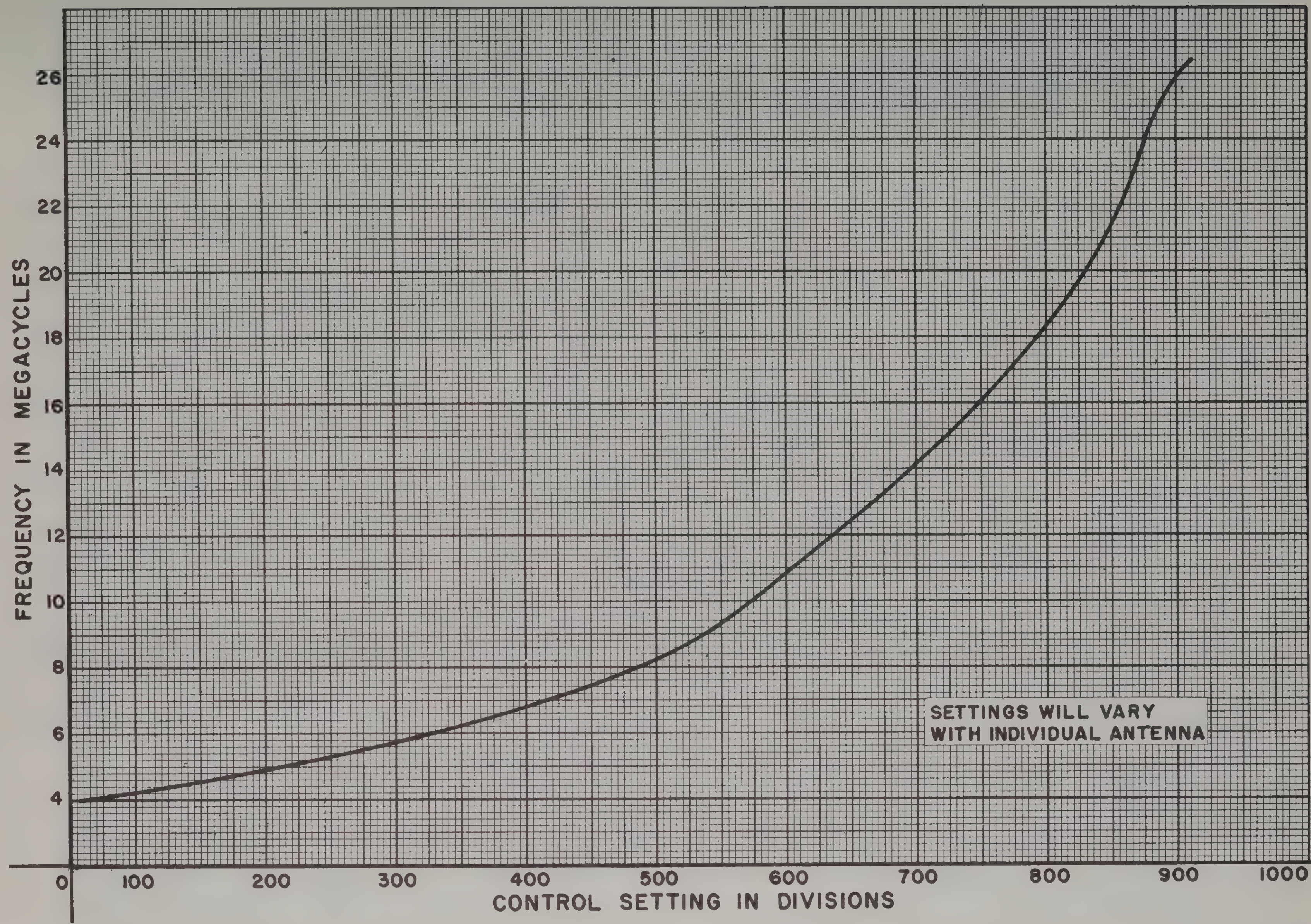


Figure 49. Output Frequency vs. ANTENNA TUNING Dial Indication.

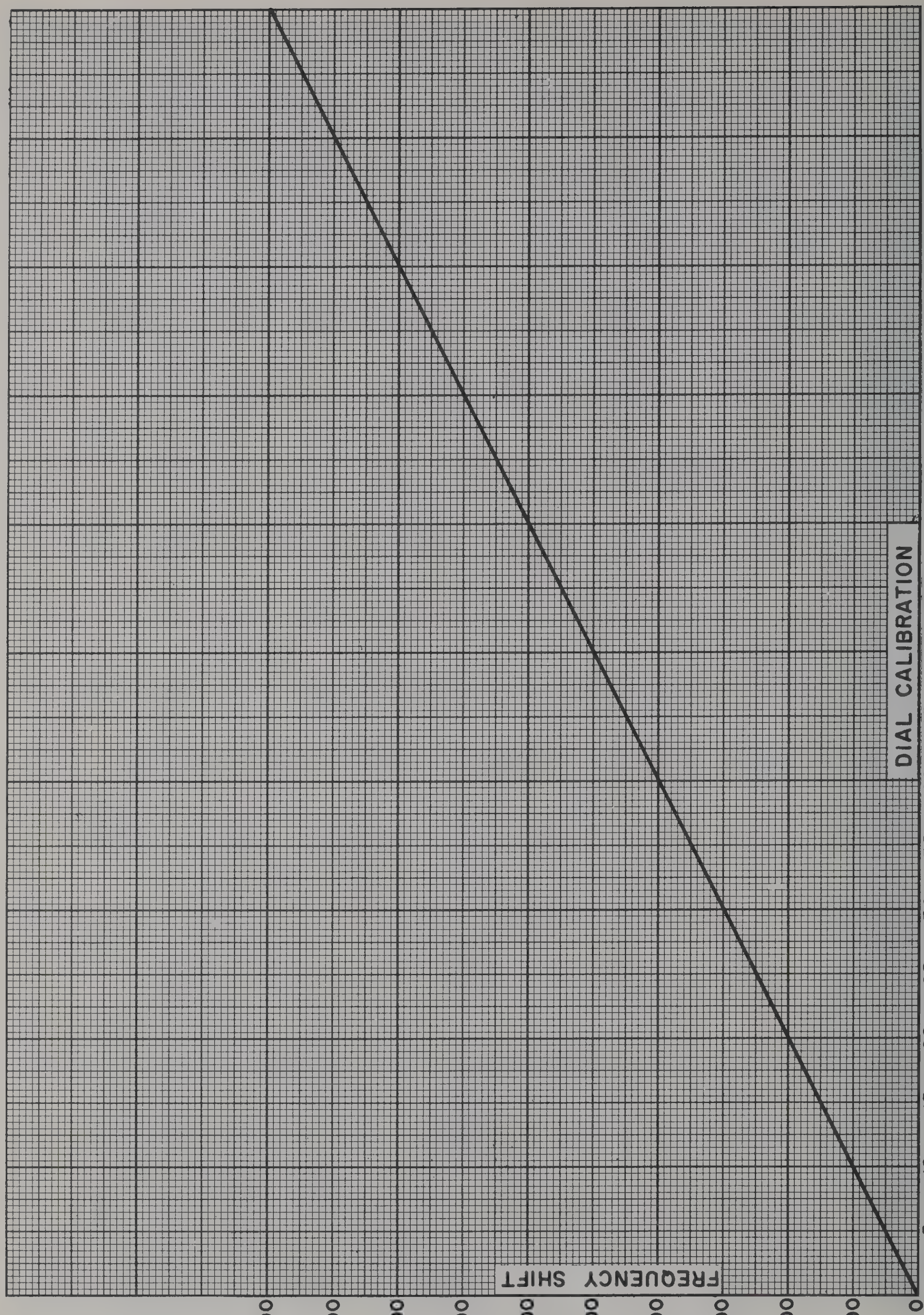


Figure 50. Frequency Shift vs. BASIC SHIFT Dial Indication.

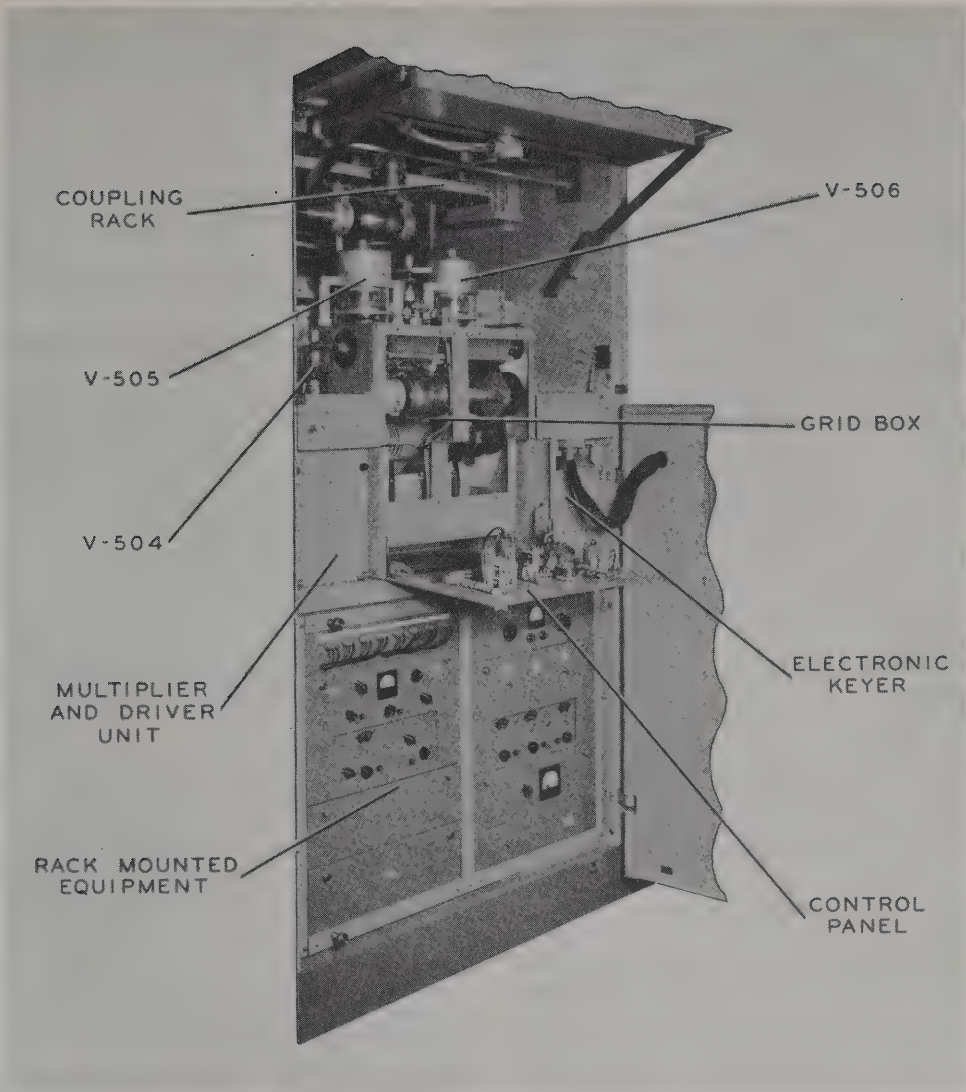


Figure 51. Radio Transmitter T-454/FRT-26, Doors Open, Grid Shield Removed.

h. Turn the EXCITATION SELECTOR switch (S-527) to the 1-SWR position.

i. Set the KEYING SELECTOR switch (S-501) at the LOCAL position.

j. With the SSB exciter, apply a single-tone modulated signal to the transmitter, of such a magnitude that a small indication, of the order of one tenth full scale, appears on the EXCITER TEST NO. 1 meter.

k. Depress one of the PLATE ON switches, (S-519 or S-309) on the IPA or IPA Power Supply bays, respectively.

l. Tune the DRIVER PLATE control $\boxed{C}$ to resonance by adjusting for minimum swr as indicated by the EXCITER TEST NO. 1 meter.

m. Turn the EXCITATION SELECTOR switch to the SSB position.

n. Turn the EXCITER TEST switch to position 4.

(1) L.P.A. GRID R.F. PEAK - 1000 v.

(2) L.P.A. PLATE R.F. PEAK - 10 kv.

o. Turn the P.A. TEST switch (S-504) to the TOTAL P.A. GRID - 1.0 amp position.

p. Turn the TUNE-OPERATE switch to the H.V. TUNE position.

Note. As soon as the TUNE-OPERATE switch is turned to the H.V. TUNE position, the POWER AMP. PLATE control on Radio Transmitter T-454/FRT-26 should be adjusted for minimum total plate current, as indicated on the TOTAL P.A. PLATE meter (M-502).

q. Increase SSB excitation until there is 100 volts r-f peak at the grids of the IPA, as indicated on EXCITER TEST NO. 1 meter.

r. Recheck the DRIVER PLATE TUNING control $\boxed{C}$ by adjusting for maximum r-f peak voltage at the IPA grids, as indicated on EXCITER TEST NO. 1 meter.

s. Operate control $\boxed{F}$, the intermediate power amplifier ANT. TUNING control, until a noticeable increase in the intermediate P.A. PLATE current reading occurs. At the same time, readjust POWER AMP. PLATE control $\boxed{D}$ for minimum plate current. During this process keep an eye on the TOTAL GRID CURRENT meter (M-1503), on R-F Amplifier AM-738/FRT-22, and <u>do not let it exceed 2.5 amperes.</u> Increase or decrease the intermediate POWER AMP. LOADING control $\boxed{E}$ as necessary to limit the PA grid current.

t. Depress PLATE ON button S-1508 or S-1609 and immediately adjust the PLATE TUNING control $\boxed{H}$ for minimum reading on the TOTAL PLATE CURRENT meter (M-1501). The dial setting should be kept close to that shown on the tuning chart, as there may be one or more false resonances at this stage of tune-up.

u. Vary the ANTENNA TUNING control $\boxed{J}$ for maximum TOTAL PLATE CURRENT and readjust PLATE TUNING control $\boxed{H}$ for minimum. Repeat this step until the maximum of accuracy is obtained.

v. Adjust the Intermediate POWER AMP. LOADING control $\boxed{E}$ so that the ratio between IPA r-f peak plate voltage and IPA r-f peak grid voltage is approximately 13 to 1; e.g., if the peak r-f grid voltage is 100 volts, adjust the loading to the point where the peak r-f plate voltage is 1.3 kv. Once this ratio is set, do not change the IPA loading.

w. Adjust the output of the SSB exciter to the point where the PA total grid current is 0.5 ampere, indicated on the TOTAL GRID CURRENT meter (M-1503) on R-F Amplifier AM-738/FRT-22.

x. Adjust the LOADING control $\boxed{I}$ to bring the total PA plate current to 8 amperes, as indicated on the TOTAL PLATE CURRENT meter (M-1501).

y. Repeat steps w. and x. until maximum accuracy is obtained.

z. Recheck the PA plate voltage, and adjust to 5000 volts.

aa. If the load presented to the transmitter by the transmission line is lower than 600 ohms and the operating frequency is 4000 kc or slightly higher, it may not be possible to increase the loading enough to produce the desired result. If this is the case, insert either the 100-uuf or the 250-uuf fixed vacuum capacitor (which will be found in the dummy mounting clips in the rear of R-F Amplifier AM-738/FRT-22) into the clips designated C-1587, which are located directly behind the variable vacuum antenna tuning capacitor C-1532, and try again.

ab. Carefully recheck all tuning controls to make certain that all adjustments are as nearly perfect as possible. Make only small movements of the controls at this step, as some of them will be very sensitive to adjustment. If the PLATE TUNING control should be shifted too far, the PA plate current will rise to a sufficiently high value to trip one of the PA overloads. In case this does happen, switch the TUNE-OPERATE switch back to the H.V. TUNE position and again turn the high voltage on. Carefully adjust the PLATE TUNING for minimum PA plate current and return the TUNE-OPERATE control to the OPERATE position.

ac. With the transmitter tuned and loaded as indicated, remove the single-tone excitation and proceed with single-sideband transmission.

21. Tuning Procedure for Reduced Power (15 kw) Operation

The following procedure should be followed for tuning Transmitter AN/FRT-22 when operated under reduced power.

a. Refer to paragraph 35 for changes necessary to operate the set at reduced power output.

b. With step a., above, complete, refer to paragraph 17, steps a. through x. for tuning procedure.

Note. Shorting switch $\boxed{G}$ should be left in the closed position unless it becomes impossible to load the IPA to the proper value. This may occur when the output frequency is 20 mc or higher.

Operate the shorting switch $\boxed{G}$ to OFF when the IPA will not load sufficiently with the loading control set at maximum.

c. Omit any operations in steps a. through x. of paragraph 17 that refer to the PLATE TUNING control $\boxed{H}$, LOADING control $\boxed{I}$, ANTENNA TUNING control $\boxed{J}$, or PLATE TANK SHORT switch $\boxed{N}$. Omit all operations referring to switches or controls which have designations of four figures, e.g., S1604, M-1503, etc.

d. Having completed step x. of paragraph 17 of this section, carefully adjust controls designated POWER AMP. PLATE TUNING $\boxed{D}$, POWER AMP. LOADING $\boxed{E}$, and ANT. TUNING $\boxed{F}$ until the IPA plate current is approximately one-half of the final desired operating current. Remember that control $\boxed{D}$ is always adjusted for minimum intermediate power amplifier plate current, control $\boxed{F}$ is adjusted for maximum IPA plate current, and control $\boxed{E}$ is used to set the plate current to the desired value.

e. Rotate TUNE-OPERATE switch to OPERATE

f. Adjust POWER AMP. LOADING control $\boxed{E}$ until the plate current is at the desired operating value.

Note. A power input of 20 to 21 kw is required for 15 kw output. This will require approximately 3.5 amperes of IPA plate current, depending on the d-c plate voltage.

g. Refer to steps ag. through ai. of paragraph 17 of this section for the final tuning adjustments and checks.

22. Using the Channel Selector

In both the IPA bay and the PA bay, tuning controls for each channel are located behind hinged panels on the front of the preset tuning control panels. A small button is located adjacent to each of the smaller panels. To open a panel, push the button to the right. No special operating procedures are involved in changing channels. When the channel selector switch is operated, the servo-tuned circuits will be set according to the settings of the control potentiometers for that channel. A red lamp indicates the channel in use.

Note. If EXCITATION SELECTOR switch S-527 is in 1-SWR or SSB positions, channeling will open the circuit to undervoltage-release coil K-401B to shut down both high-voltage supplies. When channeling is completed, the h-v contactors will close for normal operation.

23. Stopping Procedure

To turn off the transmitter, normal procedure is first to depress one of the PLATE OFF buttons on Radio Transmitter T-454/FRT-26 or Power Supply Assembly PP-1088/FRT-26, and then to operate one of the red toggle switches on either of the same two units to the OFF position. When transmission is to be resumed on the same frequency, return the transmitter to operation by turning the toggle switch back to the ON position, waiting the length of the filament time delay, and then depressing one of the IPA PLATE ON buttons. Trim any tuning controls if necessary. If the transmitting frequency is to be changed from what it had been before shutdown, it will be necessary to set the TUNE-OPERATE switch to L.V. TUNE position and proceed as in paragraphs 17 d. through 17 ai.

24. Typical Meter Readings

These readings are approximate; some deviation from them is to be expected in operation.

OPERATING FREQ. KC	METER RANGE	4000	6000	8000	10000	12000	14000	16000	18000	20000	22000	24000	26000
Buffer and 1st Mult. Grid	0-10 MA	1.9	1.6	1.8	1.8	1.6	2.4	2.2	1.7	1.8	1.6	1.7	2.0
Buffer Cathode Current	0-100MA	12	14	12	16	15	9.0	14	15	15	15	15	12
1st Mult. Cathode Current	0-100MA	10	9.0	9.0	9.0	10	11	11	14	13	14	13	14

24. Typical Meter Readings (contd)

OPERATING FREQ. KC			METER RANGE	4000	6000	8000	10000	12000	14000	16000	18000	20000	22000	24000	26000
2nd Mult. Grid Current			0-10 MA	1.0	1.7	2.2	3.0	3.6	3.9	3.9	3.0	2.7	2.6	2.1	1.7
2nd Mult. Cathode Current			0-200MA	20	20	26	32	36	40	40	40	40	40	40	40
Driver Grid Current			0-50 MA	10	10	10	9.5	10	9.0	9.5	6.5	4.5	5.0	5.0	2.0
Driver Cathode Current			0-500MA	245	200	185	195	205	200	205	215	220	235	255	240
Total I.P.A. Grid Current			0-1 A	0.46	0.39	0.37	0.34	0.33	0.30	0.34	0.37	0.35	0.40	0.39	0.35
I.P.A. Plate Current			0-8 A	2.4	2.5	2.4	2.8	2.6	3.0	2.7	2.7	2.5	2.6	2.8	3.0
I.P.A. Plate Voltage			0-8 KV	5.1	4.9	5.0	4.9	4.9	4.9	4.95	4.95	4.9	5.0	4.95	5.0
I.P.A. Grid Current	Left		0-500MA	265	200	185	170	170	170	175	195	160	215	225	190
	Right		0-500MA	195	190	180	160	170	125	160	175	185	180	165	155
I.P.A. Cathode Current	Left		0-5 A	1.25	1.35	1.30	1.45	1.45	1.50	1.50	1.55	1.50	1.60	1.65	1.80
	Right		0-5 A	1.40	1.35	1.30	1.45	1.35	1.55	1.35	1.35	1.25	1.25	1.40	1.50
I.P.A. Grid RF Peak Voltage	Left		0-1000 Peak V	620	540	520	520	510	640	550	600	630	630	700	550
	Right		0-1000 Peak V	550	510	500	510	490	500	510	600	610	610	640	520
I.P.A. Plate RF Peak Voltage	Left		0-10 Peak KV	4.8	4.5	4.6	4.4	4.5	4.0	4.5	4.6	4.5	4.6	5.2	4.5
	Right		0-10 Peak KV	3.9	3.8	3.9	3.7	3.8	3.3	3.9	4.0	3.8	3.9	4.0	3.7
P.A. Grid Current	Left		0-1.25A	1.20	1.24	1.25	1.25	1.10	1.03	1.01	1.13	1.01	0.96	0.85	0.80
	Right		0-1.25A	0.67	0.80	0.67	0.77	0.84	0.82	0.99	0.84	0.70	0.93	0.88	0.90
	Total		0-3 A	1.87	2.04	1.92	2.02	1.94	1.85	2.00	1.97	1.71	1.89	1.73	1.70
P.A. Cathode Current	Left	1	0-5 A	1.60	1.50	1.80	1.90	1.50	1.40	1.40	1.45	1.40	1.15	1.35	1.30
		2	0-5 A	1.70	1.75	1.50	2.05	1.50	1.45	1.80	1.55	1.50	1.35	1.40	1.50
		3	0-5 A	2.00	1.75	2.05	2.10	1.50	1.75	1.85	1.85	1.90	1.65	1.80	1.90
	Right	1	0-5 A	2.05	2.10	2.00	1.70	2.20	2.05	2.10	2.05	2.00	2.30	2.05	2.00
		2	0-5 A	2.10	2.15	2.00	1.80	2.30	2.20	2.10	2.25	2.20	2.50	2.20	2.20
		3	0-5 A	1.95	2.00	1.85	1.65	2.10	1.95	2.00	2.00	1.95	2.25	2.10	2.15
Total P.A. Plate Current			0-20A	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5
D.C. Plate Voltage			0-8KV	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
R.F. Grid Peak Voltage	Left		0-1000 Peak V	700	700	790	750	720	720	700	670	600	610	630	840
	Right		0-1000 Peak V	600	630	720	630	660	710	680	660	560	650	680	720
R.F. Plate Peak Voltage	Left		0-10KV Peak	4.7	4.8	5.3	5.0	5.1	5.2	5.7	5.3	5.7	5.4	7.2	6.4
	Right		0-10KV Peak	4.6	4.8	5.3	5.1	5.0	5.2	5.7	5.3	4.9	5.7	7.0	5.6
Transmission Line Current*	Left		0-15A	10.2	11.8	12.0	12.8	12.4	12.2	11.4	9.7	8.5	7.4	6.0	6.6
	Right		0-15A	10.5	11.3	12.4	13.2	13.1	12.9	11.9	10.3	9.0	7.8	7.0	7.2

*Line currents may vary widely with individual antenna.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

25. General

Operation of Radio Transmitting Set AN/FRT-22 may be difficult in regions where extreme heat, humidity, moisture, sand conditions, etc., prevail. In the following paragraphs instructions are given on procedures for minimizing the effect of these unusual operating conditions.

26. Operation Under Conditions of High Humidity

It is recommended that if the transmitter is to be operated in a high-humidity region, the room in which the transmitter is sited be humidity-controlled. If this is impossible, it is advisable to locate heat lamps around the transmitter enclosure to keep the equipment warm when the transmitter is not being used. If high-humidity conditions occur only occasionally, allow the filaments to run continuously during these conditions. High humidity causes condensation of moisture on the equipment whenever the temperature of the equipment becomes lower than that of the ambient air.

27. Operation at Dusty Locations

The main problem which arises with equipment operation in desert areas is the large amount of sand or dust and dirt which enters the moving parts of radio equipment, such as blowers and driving motors. The ideal preventive precaution is to house the equipment in a dustproof shelter. The next best precaution is to clean the air filters frequently. Take care to keep the equipment as free from dust as possible. Make frequent preventive maintenance checks (ch. 3). Pay particular attention to the lubrication of the equipment. Excessive amounts of dust, sand, or dirt that come into contact with oil and grease result in grit, which will damage the equipment.

28. Miscellaneous Precautions

a. The building in which the transmitter is located should be kept free of insects, rodents, and other small animals. Consider, for example, a mouse in the high-voltage power supply.

b. If the heating system of the building in which the transmitter is sited fails, the transmitter filaments should be turned on and left on until the difficulty is remedied.

c. Under high-temperature conditions it is especially important to check the blowers and air filters frequently to insure the transmitter is being adequately ventilated. Under high-temperature conditions, check points of lubrication frequently.

Section V. INITIAL ADJUSTMENTS

29. General

The following adjustments are to be made after the equipment is completely installed. It is assumed that the equipment has been properly connected with other units of the system. If difficulty is experienced in obtaining the results specified in these procedures, refer to the adjustments and corrective procedures included in chapter 3 and chapter 5.

30. Mechanical Inspection

After setting up the transmitter and making external connections, make a thorough inspection of the equipment and its associated wiring.

Warning: Perform items 31 a. (1) through 31 a. (3) with all power off.

31. Test and Setup Procedure

Carefully check the primary line and the plate-transformer connections to make certain that the phasing is exactly as shown in the wiring and schematic diagrams. This is very important, as the life of the rectifier tubes can be materially shortened by improper phase relationship between plate and filament voltages. Test and set-up procedure should be as follows:

a. Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26 (fig. 52).

(1) *Initial setting.* Set P. A. CONTROL switch S-1608 (located below relays inside front door of Power Supply Assembly PP-1089/FRT-22) to the OFF position.

(2) *Time delay and overload settings.*

(a) Set the filament time delay timer, K-304, at 30 seconds.

(b) Set the blower hold-on timer, K-305, for 5 minutes.

(c) Set the non-automatic restart interval timer, K-312, for 30 seconds.

(d) Set the automatic restart interval timer, K-316, for 10 minutes.

(e) Set the automatic shutdown time delay timer, K-323, for 15 minutes.

(f) Set the RECYCLE SELECTOR switch, S-317, to position 3. This switch is located behind the snap-on relay cover on the panel below the time delay instruments.

(g) Check the adjustment of overload relays K-324 and K-325, making certain that they are set at 2.5 amperes.

(h) Check overload relay K-319, making certain that it is set for 5 amperes.

(i) Check overload relay K-326, making certain that it is set at 0.4 ampere.

(j) Check the bias interlock relay, K-307, making sure that it is adjusted for 0.25 ampere.

Note. The trip setting of these overload relays is indicated by the projection of the plunger below the bottom surface of the coil. The lower the bottom edge of the plunger, the higher the current rating for the trip setting of the breaker. There are several identifying marks on the plunger guide which represent calibrations as indicated on the upper edge of the identifying plate. The position of the plunger for change of calibration is adjusted by rotating it around its axis.

(3) *Filament and blower checkout.*

(a) Starting with all circuit breakers on the control panel of Power Supply Assembly PP-1088/FRT-26 in the down, or open position, and the red FILAMENT - EMERGENCY SHUT DOWN toggle switches on the lower edge of the upper front door in the OFF position, proceed to check as follows:

(b) Turn on the 230-volt power to the transmitter.

(c) Close the LOW LEVEL FILAMENT breaker, S-304, and operate both red FILAMENT - EMERGENCY SHUT DOWN switches to the ON position. This will turn on all rectifier filaments and all other filaments except those of the intermediate power amplifier. Regulated primary voltage may now be checked on the LINE VOLTAGE meter by operating S-314 to pick out the circuit to be measured.

(d) To adjust the 230-volt regulating system, first jumper pin 5 to pin 7 on each of the time delay relays K-314 and K-317 located on a sub-panel behind the power unit lower control panel. Then increase the sensitivity of the voltage regulating circuit by adjusting R-356 until the motor on powerstat Z-301 begins to hunt. Adjust R-355 until 230 volts regulated is obtained. Adjust R-356 to reduce sensitivity until the motor stops hunting. Remove the jumpers from relays K-314 and K-317.

(e) Close the BLOWER breaker, S-301, and note that the blowers in both the power supply and the r-f units operate. Let the equipment operate in this condition, noting that the blower hold-on timer, K-305, is operating. At the end of the time setting, 5 minutes if the preceding procedure was followed, the blowers will automatically shut off. Restart the blowers by momentarily switching the red FILAMENT - EMERGENCY SHUT DOWN toggle switch off and then back on.

(f) Close the P. A. FILAMENT breaker, S-305, and note that the intermediate power amplifier tubes light. Check the filament voltages of these tubes by means of the P. A. FILAMENT VOLTAGE meter on the upper front panel of the power unit and the METER SWITCH, S-314, on the control panel of Power Supply Assembly PP-1088/FRT-26. Adjust these filaments to 7.5 volts by means of the left and right P. A. FILAMENT controls on the power unit control panel. Operate these controls to adjust the voltage both above and below this 7.5 volt setting to make certain that they function properly. Make sure that they are finally returned to 7.5 volts.

(g) Open the BLOWER breaker, S-301, and observe the intermediate power amplifier filaments. They should go off before blowers B-501 and B-301, located in the r-f unit and the power supply respectively, cease turning. This procedure checks the operation of the air interlock, S-511. Operate BLOWER breaker S-301 ON again.

(4) *Control circuit check-out.*

(a) Set the DELTA-WYE-OFF switch, S-401, located inside the external control unit C-1402/FRT-26 to the OFF position. Make certain that the BIAS AND L. V. breaker, S-302, is open. Then, using a piece of paper, cardboard, or other convenient material, block the bias interlock

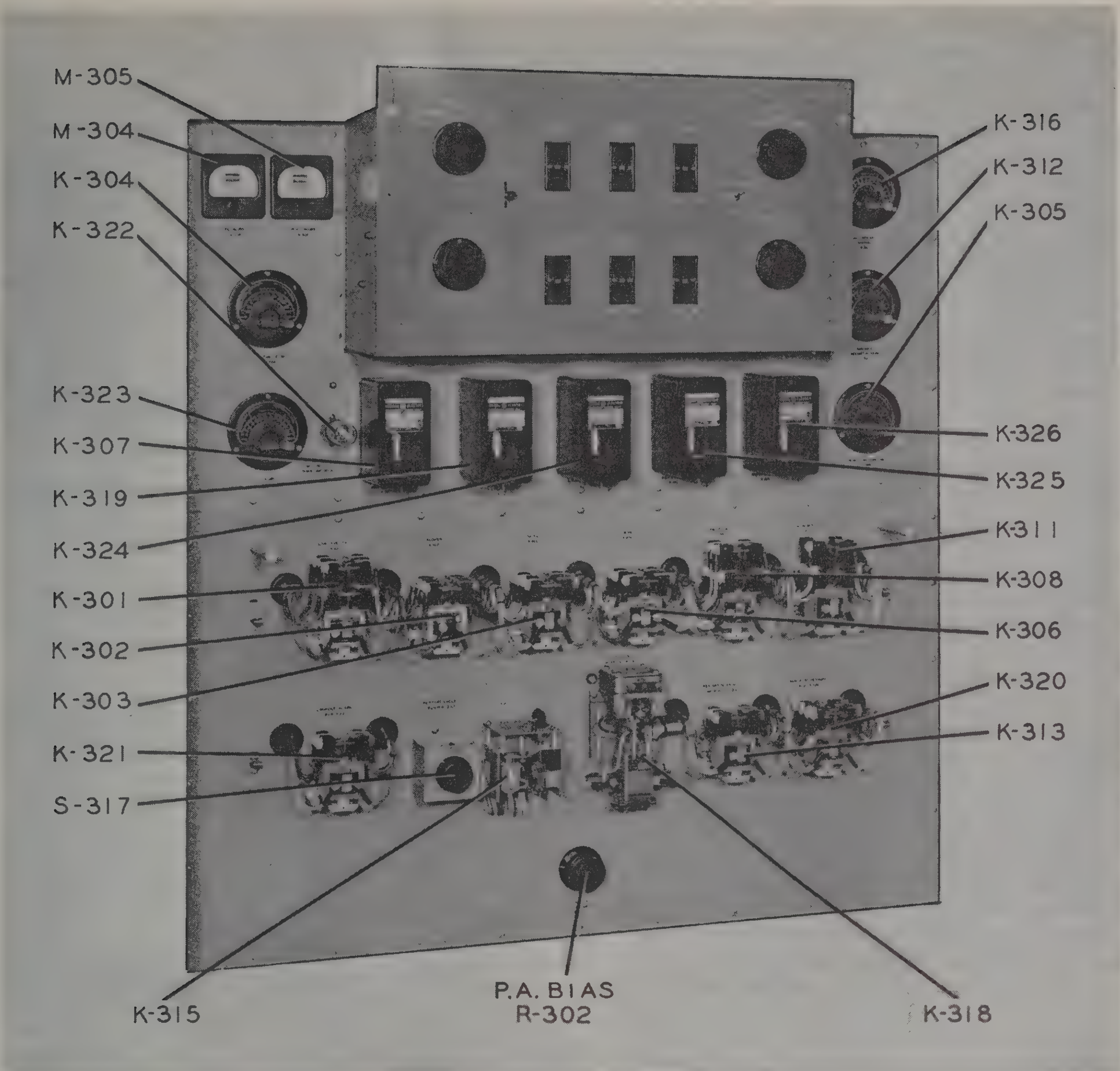


Figure 52. Relay Panel, Power Supply Assembly PP-1088/FRT-26.

relay, K-307, with its plunger in the raised position.

(b) Close the CONTROL CIRCUIT breaker, S-303. Note that IPA meter lamps light. Check both upper front doors and all four rear doors, making certain that they are tightly closed. Locate relay K-306 on the power-unit control panel and see that it is closed. Open an upper front door and note that this relay opens immediately. Reclose this door and proceed to check the operation of the plate-control circuit as follows:

(c) Set the TUNE-OPERATE switch, S-310, to the L. V. TUNE position, and depress the PLATE ON button, S-309, or S-519. Locate relay K-308 and note that it closes when this button is depressed. Move the TUNE-OPERATE control to the H. V. TUNE position. The main breaker should close. A whirring and clicking noise should be heard for a brief interval, followed by a thud, and then silence. If the whirring noise continues it is an indication that the breaker is not properly adjusted and should be checked according to the procedures outlined in paragraph 65 b. (3). Assuming that the breaker operated properly and closed as indicated, rotate the TUNE-OPERATE switch to the OPERATE position and listen for the closing of contactor K-402 which short circuits resistors in the external control unit C-1402/FRT-26 and sets up the

equipment for regular operation. Operate the TUNE-OPERATE switch several times between the H. V. TUNE and the OPERATE position, noting that the contactor follows the position of the switch. Remove the cover from one of the overload relays, K-319, K-324, K-325, or K-326 and, using a rod of insulating material, lift the armature until the contacts part. The main breaker should release and the pilot lights on the transmitter panels should go out. If the plate-power control has been in operation for less than 30 seconds, the main breaker will not reclose, and low voltage supplies will shut down. If the control circuit has been in operation for more than 30 seconds, K-401 will drop out momentarily and immediately reclose. Operate the overload relay as before, two more times, and note that on the third cycle the equipment will stay off, and a warning alarm will sound. Depress either of the two PLATE OFF buttons to silence the alarm.

(5) *Tuning system check out.*

(a) *Adjustment of servo amplifiers.* First, to energize the voltage-regulating circuit, operate the LOW LEVEL FILAMENT circuit breaker, S-304, to ON, and both FILAMENT - EMERGENCY SHUT DOWN switches, S-307, S-510 to ON. Close the SERVO CONTROL breaker, S-306. This applies power to the servo tuning system. Pilot lamp I-901 on the front panel of the servo power supply should light. The preset-tuning and servo-control motors may go into operation, but should stop within 50 seconds. If, during the procedures of paragraphs 31 a. (5) (b) through 31 a. (5) (g) the anti-hunting and sensitivity controls on the servo amplifiers require adjustment, perform the procedure outlined in steps 1. through 19. following.

1. Turn channel selector knob to position 5.

2. Loosen lock nuts on the two controls located on the front of the servo amplifier to be adjusted.

3. Using a flat-bladed screwdriver, rotate sensitivity control (right-hand adjustment) to full clockwise position.

4. Rotate anti-hunt control (left-hand adjustment) to full counter-clockwise position.

5. Turn the frequency dial knob corresponding to the servo amplifier being adjusted about 1/2 turn in either direction.

6. While watching the two small indicator lamps on the front of the servo amplifier being adjusted, rotate the sensitivity control slowly in the counter-clockwise direction until one indicator flashes.

7. Continue rotating as in step 6. until the indicators flash alternately.

8. Carefully back off the sensitivity control until flashing just fails to occur (This should be the proper setting for the sensitivity control).

9. Shock the system into oscillation (lights flashing alternately) by a short, quick rotation of the frequency dial.

   Note. If the system cannot be shocked into continuous oscillation, repeat steps 7. and 8. until the sensitive adjustment is achieved.

10. Rotate the anti-hunt control (left-hand adjustment screw) slowly clockwise until flashing ceases.

11. Repeat steps 9. and 10., observing frequency of flashes, until only a single light flashes as the frequency dial is rotated in either single direction.

12. Now rotate the frequency dial continuously in one direction very slowly, while rotating the anti-hunt control clockwise very slowly. The frequency of flashing of the single light should increase.

13. Continue step 12. until both lights flash rapidly.

14. Back off the anti-hunt control until only the single light flashes rapidly as the frequency dial is rotated as in step 12.

15. Check the adjustment by rotating the frequency dial very slowly in one direction and then the other. A single light should flash rapidly for each direction of rotation of the frequency dial.

    Caution: Do not attempt to operate the transmitter with any servo amplifier adjusted so that both lights remain on at the same time.

16. Further check the adjustment by rotating the frequency dial at various speeds in

a single direction and removing the hand abruptly from the dial. Only one light should flash for this single direction.

17. Repeat step 16. for the other direction and observe the opposite light.

Note. If the lights flash alternately for a single direction, the preset tuning feature of this transmitter will become less accurate, and precise tuning cannot be expected when a new channel is selected.

18. If lights flash alternately, return anti-hunt control to full counterclockwise position and repeat steps 9. through 17.

19. When proper adjustment has been achieved, tighten lock nuts carefully with 1/2 inch socket wrench, being careful not to disturb the adjustment screws.

(b) *First multiplier plate tuning.* The 1st MULTIPLIER PLATE TUNING control operation should be checked by rotating the control and noting whether the motor-driven circuit follows properly. This circuit is located inside the frequency multiplier chassis (fig. 179) and is accessible after tilting this chassis forward. If this unit is operating properly, the capacitor C-511 will be completely meshed when the control dial is reading zero, and there will be a smooth change as the dial is rotated. Any hunting or severe relay chattering must be eliminated by adjustment of the sensitivity and anti-hunting controls on the servo amplifier. The amplifiers are aligned in their rack in the same way that the controls are aligned across the front panel; that is, the first frequency-multiplier plate tuning is the left-hand unit, and so on.

(c) *Second multiplier plate tuning (fig. 180).* The 2nd MULTIPLIER PLATE TUNING is adjusted in exactly the same manner as described in paragraph (b) above except that the capacitor, C-517, will be just beginning to mesh when the control dial is reading 1000.

(d) *Driver plate tuning.* The DRIVER PLATE TUNING should operate smoothly and freely in the same manner previously described. In order to observe the driver circuit however, the cover panel must be removed from the intermediate power amplifier grid enclosure (fig. 51). To remove this panel, turn all of the thumb screws one-quarter turn counterclockwise, and lift the cover completely out of the transmitter. Operate the DRIVER PLATE TUNING control to 1000. Proper adjustment of the variable components inside this grid housing is indicated when the slider on inductor L-509 is on the second turn from the left end, the two variable capacitors in the top, C-533 and C-534, are at minimum capacity, and the variable vacuum capacitor, C-526, is approximately one-half turn from minimum capacity. Operate the control over its full range once or twice or make sure the mechanical operation within the enclosure is free of sticking and chattering.

(e) *Intermediate power amplifier tuning.* The intermediate power amplifier plate tuning control on Radio Transmitter T-454/FRT-26 is marked POWER AMP. PLATE TUNING. If the adjustments are correct, when this control is set at 1000, the copper cylinders and the contact cross-bar inside plate tank coils L-516 and L-517 will be near the top of the two coils. The top contact will be on the last turn at the rear side, and the two bars will be parallel. If variable vacuum capacitors C-569 and C-570 were removed for shipment and have been replaced, it will be necessary to check their setting in accordance with the procedure outlined in paragraph 69 f. under the heading ADJUSTMENT OF INTERMEDIATE POWER AMPLIFIER PLATE TUNING COILS AND CAPACITORS. Check the operation of the servo amplifier, adjusting its anti-hunting and sensitivity controls if necessary (refer to par. 31 a. (5)).

(f) *Loading.* The POWER AMP. LOADING control determines the position of the coupling platform on its rails. To adjust properly, first assure that the chain is removed. Then turn the control dial to 1000, and note that the motor unit operates. After the motor-drive unit has stopped, replace the drive chain in the position shown in fig. 17. The coupling platform should be in its maximum coupling position, with the lead screw operated completely clockwise, when the tuning dial is set at 1000. Do not tighten this chain excessively, but make it sufficiently tight that the upper leg of the chain does not strike the sprockets or the tighteners as it passes. Check the operation of this circuit by rotating the POWER AMP. LOADING control between its limits and noting whether the coupling platform operates smoothly over its range.

(g) *Output tuning.* The output tuning control of Radio Transmitter T-454/FRT-26 is

marked ANT. TUNING. It operates the driving motor which resonates the coupling circuit between the intermediate and final power amplifiers. If it is operating properly, with the tuning dial set at zero the sliding contacts on L-518 and L-519 will be in the position representing maximum inductance, and the two variable vacuum capacitors C-571 and C-572 will be at maximum capacity. Operate the control several times to be sure that the circuit is operating smoothly without sticking or binding.

(6) *R-F Oscillator O-270/FRT-26.*

(a) Close circuit breaker S-302 and rotate the DELTA-WYE-OFF switch, S-401, to WYE position. Remove the blocking cardboard from K-307. Set the keying selector switch, S-501, to the LOCAL position and open all test keys by operating them to the center position.

(b) With the 115-volt power connected to the oscillator, the CRYSTAL HEATER lamp I-1103 should light, indicating that the oven heater is working.

(c) Filament voltage for the oscillator and buffer in R-F Oscillator O-270/FRT-26 is supplied from the same transformer, T-1101, that supplies the crystal heater voltage. The FILAMENT pilot, I-1102, should light when the 115-volt line is connected.

(d) Set the TUNE-OPERATE switch, S-310, to the L.V. TUNE position, and depress the PLATE ON button. This turns on the low-voltage d-c. The crystal oscillator should now be functioning.

(e) If this oscillator is connected to the transmitter input through the patch panel, there will be a buffer and first multiplier grid-current indication of between 1 and 2 ma.

(f) The frequency of the crystals may now be checked by means of an external frequency monitor connected to the monitoring output jack, J-506. The crystals can be set to the exact frequency specified by means of trimmer capacitors C-1101 through C-1110, which are located in the oscillator unit. They are readily accessible when the front panel on this oscillator is swung downward. A long fiber screwdriver is supplied with the oscillator for adjustment of these trimmers. Fig. 144 is an open view of the oscillator showing the access to these trimmer capacitors.

(7) *Power Supply PP-454/FRT-5.*

(a) Turn the ON-OFF switch to the ON position. The POWER lamp should light.

(b) Rotate the voltage switch to each position and check meter readings against the figures indicated opposite the pointer on the switch. The actual readings should be a little high if the supply is not loaded.

(8) *R-F Oscillator O-91/FRT-5.*

(a) With the 115-volt power connected to the oscillator, the CRYSTAL OVEN HEAT ON lamp should light, indicating that the oven heater is working.

(b) Operate the ON-OFF switch to the ON position. This should light the PLATE lamp.

(c) Operate S-105, the 100-kc standard switch, located on the rear of the unit, to the INT. position.

(d) Determine the frequency which is to be set up for the check: for example, 2,439,224 cps. Operate the SETUP-OPERATE switch to OPERATE and insert the headphone plug into the jack on the front panel. Set the MASTER OSCILLATOR dial to the frequency; in this case, 24 on the outer dial and 39 on the inner dial.

(e) Set the INTERPOLATION OSCILLATOR to the difference between the MASTER OSCILLATOR reading and the 5-kc checkpoint immediately below it. In the above case, this would be 42 on the outer dial and 24 on the inner dial.

A checkpoint is provided every 5,000 cycles. The INTERPOLATION OSCILLATOR reading adds to the first checkpoint immediately below the reading of the MASTER OSCILLATOR. In the above case, the first checkpoint below the MASTER OSCILLATOR reading would be 2,435,000 cycles. Thus, the INTERPOLATION OSCILLATOR dial would be set to 4224 cycles.

(f) Set the OUTPUT TUNING control as close as possible to the desired frequency. A steady tone should be heard in the headphones.

(g) Readjust the MASTER OSCILLATOR for a low pitched tone (50-100 cps). Then readjust the OUTPUT TUNING for the loudest and clearest tone.

(h) To determine if the AFC (automatic frequency control) motor and associated circuits are working properly, remove the headphone connector plug. The AFC motor should be heard going into operation.

(9) *Frequency Shift Keyer KY-45/FRT-5.* It is assumed in the following procedure that the total frequency shift is to be 850 cycles (frequency raised by 425 cycles for a mark signal and lowered 425 cycles for a space signal). The procedures are identical for a different over-all shift of frequency except for the different numerical values which apply. With the 115 volts connected to the keyer, the OVEN HEAT lamp should light, indicating that the oven heater is working.

(a) *R-f tuning.*

1. Set the EXT. OSC. ATTENUATOR to 0 db.

2. Rotate the METER 807 switch to GRID position.

3. Provide a suitable carrier from one of the two r-f oscillators.

4. Starting at position 0, rotate the MAIN TUNING dial slowly, noting two successive peak values of current as indicated on the meter. These two current peaks correspond to the two resonant peaks for the lower and upper sidebands, respectively. Rotate the MAIN TUNING dial to a position which corresponds to the lower sideband resonant peak.

5. Set the OUTPUT LEVEL control to provide 1 to 2 ma buffer and first multiplier grid current.

6. Adjust the EXT. OSC. ATTENUATOR until the METER 807 meter reads 1.5 ma. If two positions of the EXT. OSC. ATTENUATOR provide approximately 1.5 ma of grid current, use the lower-numbered position of the control.

7. Readjust OUTPUT LEVEL control as in step 5.

8. Rotate the meter switch to the PLATE position.

(b) *Frequency check.* The r-f output of the keyer must be checked to be sure that its frequency is accurate and stable. This output stability is derived from both the 200-kc oscillator and the external r-f injection stability.

1. Rotate the BASIC SHIFT control to position zero.

2. Make certain that the input frequency is adjusted to exactly 200 kc above the desired keyer output frequency.

3. Adjust a frequency meter to the desired keyer output frequency.

4. Trim the 200-kc OSC. ADJUST (in front of oven) on the keyer for zero beat.

(c) *Frequency shift.*

1. Determine the multiplication factor which is to be used. It must be 2, 4, or 8, as required to multiply the 2 to 4 mc keyer output to the desired transmitter operating frequency.

2. Set the TRANSMITTER MULTIPLICATION switch at the position corresponding to the chosen multiplication factor.

3. Set the BASIC SHIFT dial for the desired total frequency shift as indicated on the calibration chart, figure 50.

4. Set the TEST-OPERATE switch to the SPACE position. The output frequency will be lowered.

5. With the frequency monitor still connected and adjusted as it was for (b) 4. above, compare the audio beat signal now obtained, with an adjustable audio oscillator to determine the space frequency. The beat should have a frequency equal to one-half the total required shift divided by the multiplication factor. For example, if the basic shift is to be a total of 850 cycles, and the multiplication factor is 4, the audio beat signal should have a frequency equal to (850/2) times (1/4), or 106.25 cycles per second. A slight adjustment of the BASIC SHIFT control may be necessary to obtain the exact degree of shift required.

6. Operate the TEST-OPERATE switch to the MARK position. The frequency should be as much higher than the zero-shift frequency as it was lower in the SPACE position. The monitor beat note should be nearly the same as it was for space. In any event the FREQUENCY SHIFT CALIBRATION control should be adjusted until the desired total shift, e.g., 850 cycles is obtained. This may mean a shift of -400 for space and +450 for mark, etc.

(d) *Keying signal input*

1. Operate the TEST-OPERATE switch to the FSK position.

2. With a mark keying signal applied, adjust the LIMITER ADJUST control, located on the rear of the unit, until the same beat frequency as obtained in (c) 5. and (c) 6. above is obtained. This insures that the FSK mark and space correspond to those obtained from the TEST-OPERATE mark and space.

(e) *Wave shaping.* The setting of the WAVE SHAPING switch depends on keying speed. The relation between the switch positions and the keying speed is as follows:

Switch Positions	Keying Speed Dot Cycles Per Second
1	0 to 23
2	23 to 60
3	60 to 120
4	120 to 240

Position 4 provides minimum wave shaping.

b. R-F Amplifier AM-738/FRT-22 and Power Supply Assembly PP-1089/FRT-22 (fig. 53).

(1) *Initial setting.* Set P.A. CONTROL switch S-1608 (located below relays inside of lower front door of Power Supply Assembly PP-1089/FRT-22) to ON position.

(2) *Time delay and overload settings.*

(a) Set filament time delay timer K-1614 to 30 seconds.

(b) Set the blower hold-on timer, K-1615, for 5 minutes.

(c) Set overload relays K-1601 through K-1606 between 2.5 and 3 amperes.

(d) Set bias interlock relay K-1608 to 0.75 ampere.

(e) Set overload relay K-1607 to 12 amperes.

Note. A note covering the setting procedures of this type relay will be found under paragraph 31 a. (2) (j).

(3) *Filament and blower control check out.*

(a) Remove the rectifier tubes from the power unit, remove the dust cover, and replace the tubes.

(b) Turn on all FILAMENT - EMERGENCY SHUT DOWN toggle switches.

(c) Turn on RECT. FILAMENT breaker S-1604 and note that the FILAMENT lamp on the rectifier unit lights.

(d) Check the regulated line voltage by means of METER SWITCH S-1621 and LINE VOLTAGE METER M-1602 on the power unit. Regulated line voltage should be 230 volts.

(e) Using a portable a-c voltmeter, check the filament voltages on all of the rectifier tubes. They should be within 5% of 5.0 volts for the 4B32 and 2.5 volts for the 3B28 tubes.

Note. Do not use a rectifier-type meter such as a volt-ohm-milliameter. Such instruments are not sufficiently accurate for this check. It is recommended that a good iron-vane type meter of known accuracy be used for these filament voltage measurements.

(f) Turn off the FILAMENT - EMERGENCY SHUT DOWN switch, remove the rectifier tubes, replace the dust cover, and replace the tubes.

(g) Visually check the filament time delay relay K-1614 and the FIL. HOURS meter M-1604 to see that they are functioning properly.

(h) Check the power amplifier blower direction of rotation by momentarily closing then opening the blower breaker, S-1601, and visually checking the blower rotor before it comes to a stop. If this blower is rotating backwards, reverse the wires on terminals 207 and 208 located on E-1514. Close the BLOWER breaker before proceeding with the next step.

(i) Turn on P.A. FILAMENT breaker S-1605 and note that the power amplifier tube filaments (6 total) light and that the FILAMENT lamp on R-F Amplifier AM-738/FRT-22 lights. Check the filament voltage by means of METER SWITCH S-1621 and the P.A. FILAMENT VOLTAGE meter M-1603.

(j) Operate the P. A. FILAMENT rheostats R-1639 and R-1640 to see that they function properly in raising and lowering fil-

ament voltages. Check to see that the left-hand control affects the left power amplifier, etc. Set these filament voltages to within 2% of 7.5 volts. Turn off the BLOWER circuit breaker, S-1601, and note that the power amplifier filaments go off before blowers B-1501 and B-1601 stops rotating. This step checks the operation of the air interlock, S-1507. Reclose the BLOWER breaker and proceed with the next step.

(k) Momentarily turn off and reclose each of the FILAMENT - EMERGENCY SHUT DOWN switches, noting that all the transmitter filaments go off when the switches on Power Supply Assembly PP-1088/FRT-26 and Radio Transmitter T-454/FRT-26 are opened, while only the filaments of R-F Amplifier AM-738/FRT-22 and the rectifier tubes in Power Supply Assembly PP-1089/FRT-22 go off when either of the two switches on these units are opened. Leave one switch open and note that all blowers continue to run until their respective blower hold-on timers complete their cycle, at which time the blowers shut down automatically. Restart the filaments and proceed with the next step.

(4) *Control circuit check out.*

(a) Remove the plate cap connectors from all twelve 4B32 rectifier tubes and let the leads hang, making certain that none of these connectors make contact or near contact with the ground or any other connector. Turn on BIAS breaker S-1602.

(b) Turn on CONTROL CIRCUIT breaker S-1603 and note that the meter lamps light. If all doors are closed, the BIAS lamps will light and the bias supply will be on. Look at the bias under voltage relay, K-1608, to see that the orange flag is visible through the glass front. This is an indication that normal bias is present.

(c) Open and reclose each upper front door and both rear doors in turn, noting each time that all bias lamps go out and the orange flag on the bias relay drops while the door is open, but they immediately go on when the door is reclosed.

(d) Check the operation of P. A. PLATE VOLTAGE control S-1622 by rotating the knob in the clockwise or RAISE direction and holding it in this position until the red upper limit lamp lights. Rotate the knob in the opposite or LOWER direction and hold it until the green lower limit lamp lights. Release the voltage control.

(e) Set TUNE - OPERATE switch S-310 on Power Supply Assembly PP-1088/FRT-26 to L.V. TUNE and depress the PLATE ON push button on the upper front door of Power Supply Assembly PP-1089/FRT-22. This should cause the motor-operated circuit breaker K-1701, located in Power Control C-598/FRT-6 to close with noticeable sound, the red P.A. PLATE lamps on the r-f unit and the power supply to light, and the external hv warning lamps to light. If the breaker does not operate in what appears to be a normal manner, refer to paragraph 65 b. (3) for adjustment.

(f) With the high voltage on, check the overload circuits. To do this, remove the covers from the six power amplifier relays and the one d-c overload relay, and manually lift the armatures, one at a time, until the contacts part. The high voltage breaker should trip out, and it may or may not reclose automatically depending upon the setup of the reclosing circuit. If it does not reclose automatically, turn it on manually each time to check all relays.

(g) Check the operation of the automatic recycling circuit as follows:

1. Manually turn on the high voltage and almost immediately operate one of the overload relays. The supply should go off and stay off.

2. Manually depress the PLATE ON button and wait about 45 seconds before operating an overload relay. This time when the overload relay is operated, the supply should go off, but should come back on again almost immediately.

3. Operate the overload relay twice. The last overload operation should cause the high voltage to go off and the lockout alarm horn to sound. Depress any PLATE ON button to quiet the alarm.

4. Replace the plate cap connectors on the 4B32 rectifier tubes and again depress the PLATE ON button. This time the P. A. PLATE VOLTAGE meter should indicate between 3,000 and 4,000 volts.

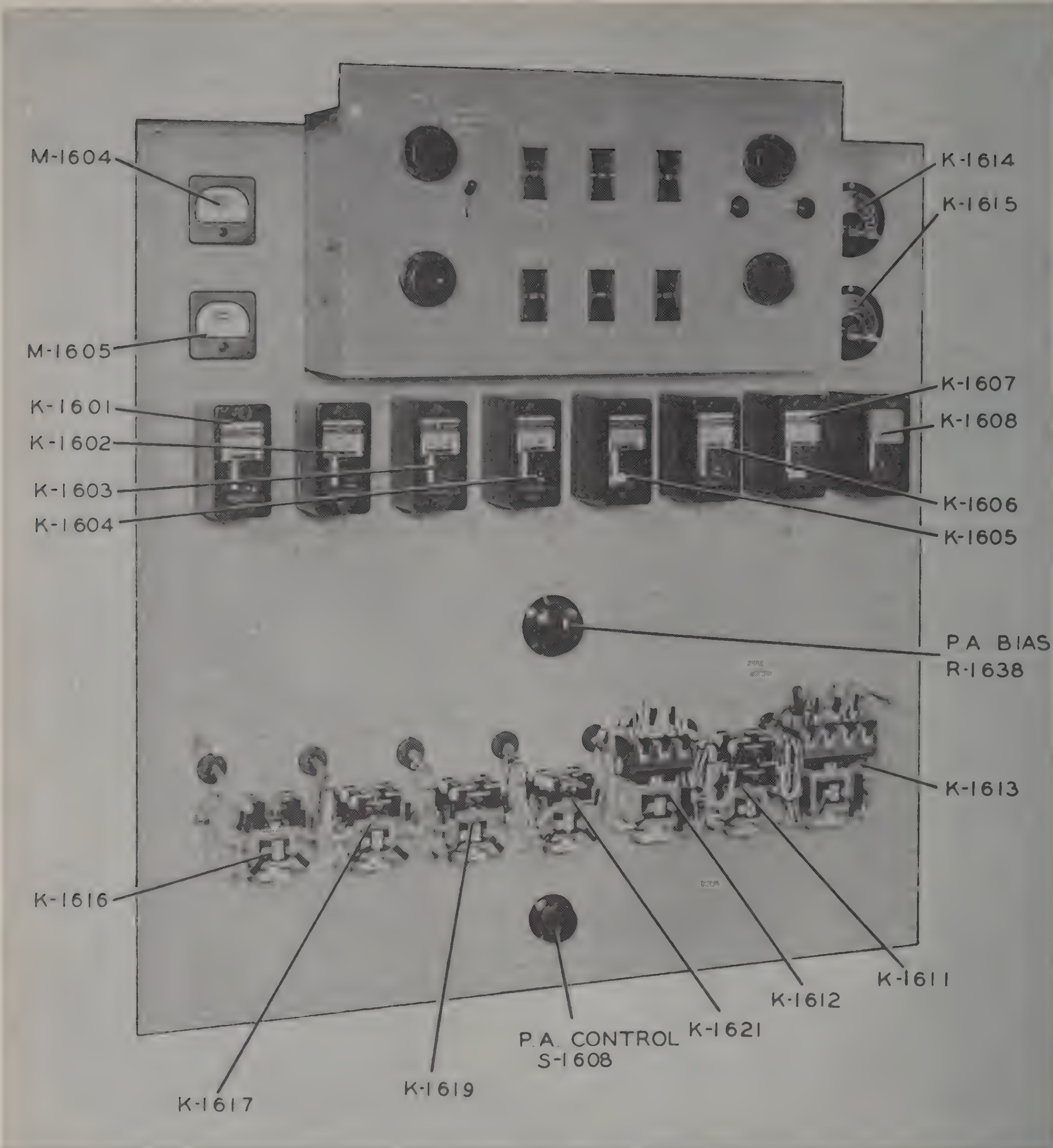


Figure 53. Relay Panel, Power Supply Assembly PP-1089/FRT-22.

(5) *Tuning system check-out.*

(a) *Setup.* First, to energize the voltage-regulating circuit, operate the LOW LEVEL FILAMENT circuit breaker, S-304, to ON, and both FILAMENT - EMERGENCY SHUT DOWN switches, S-307, S-510, to ON. Close the SERVO CONTROL breaker S-1607. This applies power to the servo tuning system. POWER ON lamp I-901 front panel of the servo power supply unit in R-F Amplifier AM-738/FRT-22 should light. Within a few seconds, several control motors may

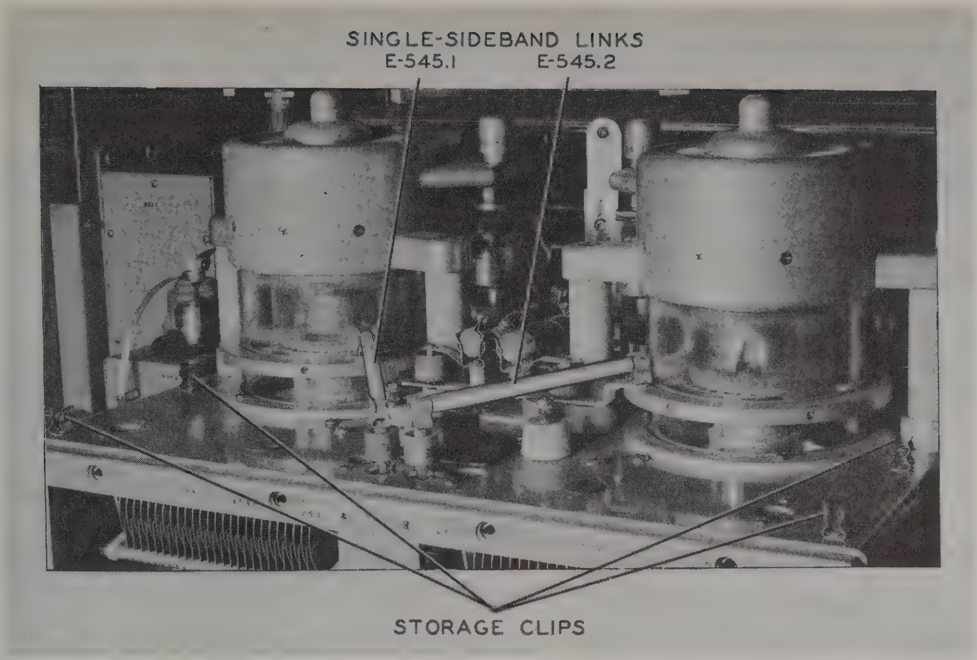


Figure 54. Radio Transmitter T-454/FRT-26, Showing SSB Coupling Links in Place.

begin operation simultaneously. They should stop within a maximum period of 50 seconds.

(b) *Power amplifier tuning.* If the adjustments are correct, when the PLATE TUNING control is set at 1000, the copper cylinders inside plate tank coils L-1505 and L-1506 will be near the top of the two coils. The top contact on each coil will be on the top turn at the rear. If the variable vacuum capacitors, C-1530 and C-1531, were removed for shipment and have been replaced, it will be necessary to check their setting in accordance with the procedure outlined in paragraph 69 h. under the heading ADJUSTMENT OF POWER AMPLIFIER PLATE TUNING COILS AND CAPACITORS. Check the operation of the servo amplifiers, and adjust the antihunting and sensitivity controls as described in paragraph 31 a. (5).

(c) *Loading.* The LOADING adjustment controls the position of the coupling platform on its rails. To adjust properly, first assure that the chain is removed. Then turn the control dial to 1000. After the motor drive unit has stopped, replace the chain in the position shown in fig. 23. The antenna coupling unit should be in its maximum coupling position. Do not tighten this chain excessively, but make it sufficiently tight so that the upper leg of the chain does not strike the sprockets or the tightener as it passes. Check the operation of this circuit by rotating the loading control over its range and noting whether the platform operates smoothly.

(d) *Antenna tuning.* The ANTENNA TUNING control is set up by rotating the tuning dial to zero and checking to see that the coil sliding contacts on L-1507 and L-1508 are in the position corresponding to maximum inductance. The variable vacuum capacitor, C-1523, should be at its maximum capacity point. The control should be operated over its entire range several times to see that the mechanism is operating smoothly without sticking or binding.

32. Neutralization and IPA Grid and Cathode Current Balance Procedure

Refer to Chapter 5, paragraphs 69 n. through 69 q. for neutralization procedure, IPA grid current balance procedure, and IPA cathode current balance procedure.

33. Tuning for Initial Operation

The equipment is now ready for operation. Installation personnel should place the set in operation as a final check. Refer to Section III for tuning procedures applicable to the final check.

34. Modification for Linear Amplifier Operation for Single-Sideband Suppressed Carrier Use

a. Change the primary taps on Power Transformer TF-196/FRT-26 so that the plate voltage, as indicated on P.A. PLATE VOLTAGE meter M-301 is approximately 5000.

b. Change PA grid-bias link E-1615 in Power Supply Assembly PP-1089/FRT-22 to the SSB position.

c. Place the two IPA grid input SSB links E-545.1 and E-545.2 in their clips, as shown in figure 54.

d. Turn the EXCITATION SELECTOR switch to 1-SWR position.

e. Reduce the PA plate voltage to 5000 volts.

f. Without excitation, adjust IPA bias control R-302 for a total static IPA plate current of 0.8 ampere.

g. Without excitation, adjust the PA bias control R-1638 for a total static PA plate current of 2.4 amperes.

h. Tuning Procedure. With the modification complete and the input cables connected to the output of a SSB transmitter, the tuning and setup procedure as given in paragraph 20, Tuning Procedure For Single Sideband Operation should be followed to put the set in operation.

35. Procedure for Converting from 40 KW to 15 KW Operation

If it is desired to operate under reduced power, or if for some reason the power amplifier becomes inoperative and it is necessary to remain on the air, the following procedure should be followed to obtain reduced power operation:

a. Turn the P. A. CONTROL switch, S-1608, on Power Supply Assembly PP-1089/FRT-22 to the OFF position, thus disabling the control circuits of R-F Amplifier AM-738/FRT-22 and Power Supply Assembly PP-1089/FRT-22. The other two units, Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26 will function normally.

b. Disconnect the r-f lines between the output of Radio Transmitter T-454/FRT-26 and the input of R-F Amplifier AM-738/FRT-22 by removing them from the front of the contact rails and pushing them aside.

c. Make a connection from the rear end of the output coupler contact rails to the center studs of the feedthrough insulators E-661 in the roof of Radio Transmitter T-454/FRT-26 (fig. 185).

d. Remove the transmission line that is connected to the r-f ammeters on R-F Amplifier AM-738/FRT-22 and connect it to the r-f ammeters located on the top of Radio Transmitter T-454/FRT-26.

e. The unit is now ready for operating as a complete 15-kw transmitter. Refer to paragraph 21 for operating procedure.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. ORGANIZATIONAL TOOLS AND EQUIPMENT

36. Tools, Equipment Supplied with Radio Transmitting Set AN/FRT-22

a. In the IPA power control unit is a paint brush for graphite lubrication and a fuse puller.

b. In the IPA power supply bay on tool holders mounted behind the lower front door are the following tools.

(1) Straight Phillips screwdriver No. 2.
(2) Offset Phillips screwdriver No. 2.
(3) Offset Phillips screwdriver No. 1.
(4) Straight Phillips screwdriver No. 1.
(5) 3/8 in. Bristo wrench.
(6) No. 10 Bristo wrench.
(7) No. 8 Bristo wrench.
(8) No. 6 Bristo wrench.
(9) No. 4 Bristo wrench.

c. A long fiber screwdriver is supplied with R-F Oscillator O-270/FRT-26. This screwdriver is mounted on clips inside the oscillator cabinet.

d. In addition, packed separately from the transmitter, is a tube puller for intermediate power amplifier tubes V-505 and V-506.

37. Special Tools for Radio Transmitting Set AN/FRT-22

Special tools, if required, often may be improvised. For example, a safety shorting stick and several shorting jumper wires may be constructed.

a. Construction of Shorting Stick. To construct a safety shorting stick (fig. 55), secure a dry piece of wood or some other material which is a good electrical insulator. It should be about 36 inches long and about 1 inch square. Securely fasten a piece of copper or brass rod (or thin tubing) to one end of the stick. Bend the extended end of the rod in the form of a small hook. Solder a piece of heavy flexible wire about 18 inches long to the metal rod at the point where it is fastened to the stick. Attach a heavy clip to the free end of the wire.

b. Construction of Shorting Jumper Wires. The jumper wires are made from heavy flexible wire, about 18 inches long, with heavy clips attached to each end. These are intended for use as shorting links across h-v capacitors in components that are being repaired or cleaned.

Section II. PREVENTIVE MAINTENANCE SERVICES

38. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order so that breakdowns and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from trouble shooting and repair since its object is to prevent certain troubles from occurring. Refer to AR 750-5.

39. General Preventive Maintenance Techniques

a. Use #0000 sandpaper to remove corrosion.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning.

(1) If necessary, except for electrical contacts, moisten the cloth or dry brush with Solvent, Dry Cleaning (SD); then wipe parts dry with a dry cloth.

(2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a dry cloth.

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged breathing of the fumes is dangerous. Make sure adequate ventilation is provided.

c. If available, dry compressed air may be used at a line pressure not exceeding 60 psi to remove dust from inaccessible places; be careful, however, or mechanical damage from the air blast may result.

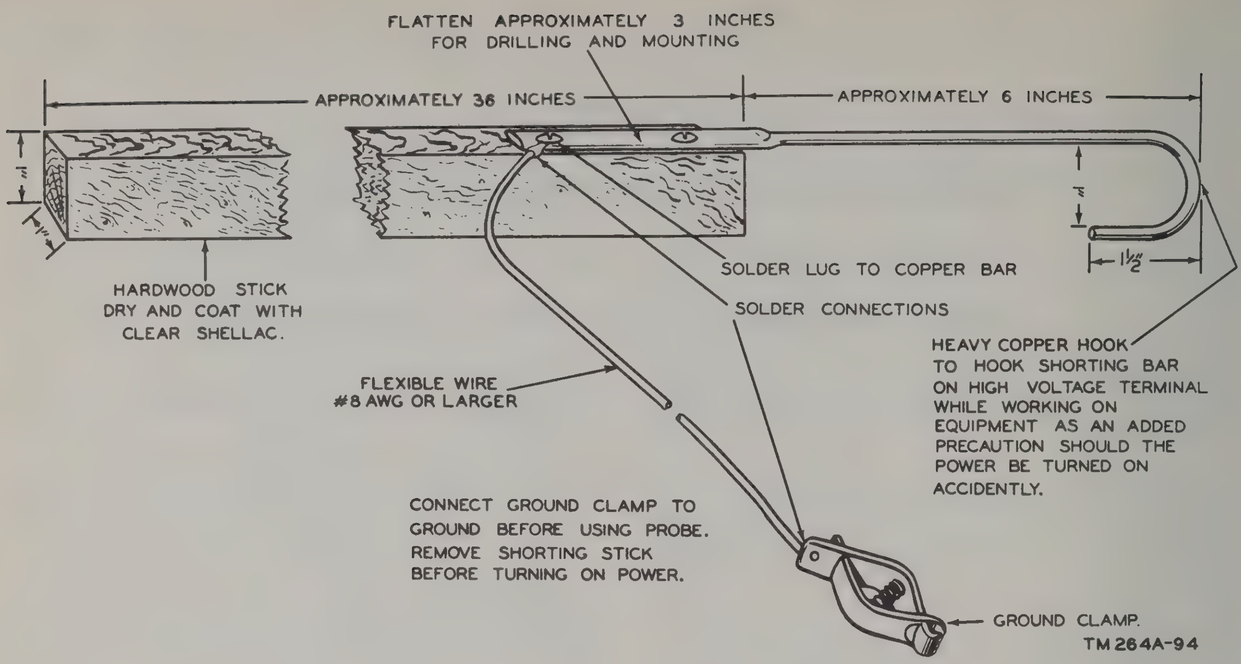


Figure 55. Construction of a Shorting Stick.

d. For further information on preventive maintenance techniques, refer to TB SIG 178.

40. Use of Preventive Maintenance Forms
(figs. 56 and 57)

The information in paragraph 41 is presented as a guide to the individual making an inspection of equipment in accordance with instructions on DA AGO forms 11-238 and 11-239. The decision as to which items on the forms are applicable to this equipment is a tactical decision to be made in the case of first echelon maintenance by the communications officer/chief or his designated representative, and in the case of second and third echelon maintenance, by the individual making the inspection. Instructions for the use of each form appear on the reverse side of the form.

41. Performing Exterior Preventive Maintenance

Caution: Tighten screws, nuts and bolts carefully. Fittings tightened beyond the pressure for which they were designed will be damaged or broken.

a. Check completeness and general condition of equipment. Check to see that the small tools supplied with the transmitter are in place. Paragraph 36 contains a list of these tools.

b. Inspect the control panels of each of the major units, and where necessary, clean jacks, plugs, knobs, etc., and remove dirt or stains from the panels.

c. Inspect seating of all accessible pilot lamps and fuses. Check external coaxial connectors for looseness. Repair or replace faulty components.

d. Operate all controls used in the normal operational procedure, and check for looseness, binding, sticking, etc. Lubricate or replace faulty controls, as necessary.

e. Using the equipment performance checklist (par. 51), check for normal operation of the transmitter. Take corrective measures as necessary.

f. Check for loose screws and bolts on exterior of equipment (rack mounting screws, large hardware, etc.), and tighten loose fasteners. Clean door panels and control panels.

g. Check exterior of all units for scratches and rusty areas. Clean marred areas with sandpaper and then repaint.

h. Check external cabling for kinks, breaks, cuts, or fraying. Replace or repair damaged cables.

i. Inspect antenna system for damaged components. Replace damaged cables, broken insulators, etc.

j. Tighten any loose lock nuts (switches, jacks, pilot lamps, etc.), and tighten any loose knobs.

k. Clean all air filters (see par. 65 c.).

l. Inspect meters for broken glass or cracked cases. Replace damaged parts.

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	CONDITION S	M	T	W	T	F	S
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (*receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories*). PAR. 41 a							
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 41 b							
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS.							
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 41 c							
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 41 d							
6	CHECK FOR NORMAL OPERATION. PAR. 41 e							

WEEKLY

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 41 f		13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 41 g		14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES. PAR. 41 k	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 41 h		15	INSPECT METERS FOR DAMAGED GLASS AND CASES. PAR. 41 l	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR. 41 i		16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHER-PROOFING.	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.		17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 41 j		18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.	

19 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA AGO FORM 1 MAY 51 11-238 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

Figure 56. DA AGO Form 11-238.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT

RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE	EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; X Adjustment, repair or replacement required; (X) Defect corrected.
NOTE: Strike out items not applicable.

NO.	ITEM	CONDITION	NO.	ITEM	CONDITION
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT *(receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).* PAR. 41 a		19	ELECTRON TUBES - INSPECT FOR LOOSE ENVELOPES, CAP CONNECTORS, CRACKED SOCKETS: INSUFFICIENT SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES. PAR. 42 a	
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION.		20	INSPECT FILM CUT-OUTS FOR LOOSE PARTS, DIRT, MISALIGNMENT AND CORROSION.	
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 41 b		21	INSPECT FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION. PAR. 42 b	
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 41 c		22	INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR LOOSE MOUNTINGS; BURNED, PITTED, CORRODED CONTACTS; MISALIGNMENT OF CONTACTS AND SPRINGS; INSUFFICIENT SPRING TENSION; BINDING OF PLUNGERS AND HINGE PARTS. PAR. 42 c	
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 41 d		23	INSPECT VARIABLE CAPACITORS FOR DIRT, MOISTURE, MISALIGNMENT OF PLATES, AND LOOSE MOUNTINGS. PAR. 42 d	
6	CHECK FOR NORMAL OPERATION. PAR. 41 e		24	INSPECT RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE. PAR. 42 e	
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 41 f		25	INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS. PAR. 42 f	
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 41 g		26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE. PAR. 42 g	
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 41 h		27	INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS. PAR. 42 h	
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR. 41 i		28	CHECK SETTINGS OF ADJUSTABLE RELAYS. PAR. 42 i	
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.		29	LUBRICATE EQUIPMENT IN ACCORDANCE WITH APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER. PAR. 42 j	
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 41 j		30	INSPECT GENERATORS, AMPLIDYNES, DYNAMOTORS, FOR BRUSH WEAR, SPRING TENSION, ARCING, AND FITTING OF COMMUTATOR.	
13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.		31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS. PAR. 42 k	
14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES. PAR. 41 k		32	INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING AND OIL-LEAKAGE. PAR. 42 l	
15	INSPECT METERS FOR DAMAGED GLASS AND CASES. PAR. 41 l		33	BEFORE SHIPPING OR STORING - REMOVE BATTERIES.	
16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING.		34	INSPECT CATHODE RAY TUBES FOR BURNT SCREEN SPOTS.	
17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION.		35	INSPECT BATTERIES FOR SHORTS AND DEAD CELLS.	
18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE.		36	INSPECT FOR LEAKING WATERPROOF GASKETS, WORN OR LOOSE PARTS.	
			37	MOISTURE AND FUNGIPROOF.	
38	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.				

DA AGO FORM 1 MAY 51 11-239 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE. o6—16—64382-1

Figure 57. DA AGO Form 11-239.

42. Performing Interior Preventive Maintenance

a. Inspect electron tubes for loose envelopes, cap connectors, cracked sockets, insufficient socket spring tension. Check receiving-type tubes in standard tube checker. Replace faulty tubes.

b. Inspect fixed capacitors for leaks, bulges, discoloration. Replace bad capacitors.

c. Inspect circuit breakers for loose mountings; burned, pitted, or corroded contacts; misalignment of contacts and springs; insufficient spring tension; binding of plungers. Refer to paragraph 65 a. for relay maintenance.

d. Inspect variable air capacitors for dirt, misalignment, etc. Clean and repair where necessary.

e. Inspect resistors and resistor mountings for cracks, chipping, blistering, discoloration. Replace faulty resistors or mountings.

f. Inspect terminals of large fixed capacitors and resistors for corrosion, dirt, and loose contacts. Clean, tighten, and repair as necessary.

g. Clean and tighten mountings of larger interior equipment.

h. Inspect terminal boards for loose connections, cracks, and breaks. Replace faulty terminal boards.

i. Check setting of main breaker (see par. 65 b.). Check the settings of overload relays (see par. 31 a (2).

j. Lubricate moving parts (see lubrication instructions, Chapter 3, Section III).

k. Tighten mounting bolts on large transformers and chokes.

l. After the equipment has been in operation, inspect transformers, chokes, potentiometers, etc., for leakage or overheating. Determine the cause of the trouble and take corrective measures.

m. Examine sliding or moving coil contacts. Replace any contacts that are worn, bent, or broken.

n. Check all meters for correct zero setting. Readjust as necessary.

o. Check all door interlocks. Repair if inoperative.

p. Remove each motor drive unit and lubricate mechanism if necessary.

Section III. LUBRICATION

43. Lubrication Instructions

a. General.

(1) Make certain that lubricants and points to be lubricated are clean and free from sand, grit, or dirt. These abrasives are the chief cause of bearing wear and thus often necessitate bearing replacements.

(2) Gasoline will not be used as a cleaning fluid for any purpose. When the unit is overhauled or repairs made, parts should be cleaned with solvent (SD). Before lubrication, wipe clean all surfaces to be lubricated; use a lint-free cloth dampened with solvent (SD). Keep solvent off surrounding parts.

(3) Carbon tetrachloride will be used as a cleaning fluid only in the following cases: on electrical equipment where inflammable solvents cannot be used because of fire hazard, and for cleaning electrical contacts including relay contacts, coil wiping contacts, plugs, etc.

(4) Apply oil (PL SPECIAL) sparingly to springs and loops of all helical springs to prevent wear and rust.

b. Lubrication Under Usual Conditions. The type of lubricant used and specific instructions for each part of the transmitter are illustrated in figures 58 through 89. The key to the letter designations used in these illustrations is as follows:

Ⓐ Lubricating oil, MIL-L-7870. Bearings: Apply as much oil as is required to fill the bearing, but not more. Wipe off any excess that remains on the outside of the bearing or surrounding parts. Check once each month; clean with solvent (SD) and relubricate if necessary. Chains: Apply a small amount; check monthly.

Ⓑ Low-temperature Lubricating Grease, MIL-G-3278. Gears: Apply a thin, even film of grease to the tooth faces only. Check monthly and, when necessary, clean with solvent (SD) and relubricate. Bearings: Fill each bearing with just sufficient grease that there is only a slight showing of grease at the seals when the blower is running. These bearings should never be too hot to touch; abnormal temperature indicates that a bearing is improperly lubricated. High temperature accompanied by excessive leakage of grease indicates too much grease. Check bearings once each month; clean and relubricate when necessary.

Ⓒ Graphite lubricant, dgf-123 dry graphite film lubricant, Collins Radio Company part no. 005 0337 00, manufactured by Miracle Power Division of the AP Parts Corporation. This lubricant is a colloidal dispersion of synthetic graphite in a non-inflammable volatile carrier. If dgf-123 or an equivalent lubricant is unavailable, dry powered graphite lubricant may be used. Using a brush or spray gun, apply a coating of lubricant sparingly to all the rubbing surfaces indicated. Check once every two weeks. When necessary, clean the friction surfaces thoroughly with a clean, lint-free cloth and cargon tetrachloride, wipe with a dry, lint-free cloth, and reapply the graphite lubricant.

Ⓓ SAE No. 30 Motor Oil. Fill bearing cups indicated monthly, and clean any excess oil from the area.

Note. The intervals given are maximum for normal 8-hour day operation. When the equipment is used for longer periods per day, the intervals shown should be shortened to compensate.

c. Lubrication Under Unusual Conditions.

(1) *Arctic regions.* No special lubrication instructions are provided for operation in arctic regions. Transmitting Set AN/FRT-22 should be housed in a building sufficient to protect it from extreme cold. During operation, the exhaust heat from the transmitter will be sufficient to heat a moderate-sized building; however, it is advisable to provide heaters, stoves, or other auxiliary heating to be used during periods when the transmitter is shut down or when weather is severe. Lubricants which are satisfactory at moderate temperatures stiffen and solidify at low temperatures; as a result moving parts bind or become inoperative. Do not allow the transmitter to become cold. If building heat is not adequate, allow the filaments to run continuously during these conditions.

(2) *Tropical regions.* High temperatures and moisture due to rain, condensation, etc., may cause lubricants which are normally satisfactory to flow from moving parts and other surfaces. These bearing surfaces will wear excessively, and hinges, fasteners, and other parts will be damaged or destroyed by corrosion. Inspect the equipment daily and lubricate it as required to insure efficient operation, using lubricants suitable for high temperatures.

(3) *Desert regions.* Dust and sand infiltration into the equipment causes grit in the lubricants and will seriously impair and damage the moving parts of the set. Hot, dry temperatures cause the lubricants to flow from the moving parts, and conditions similar to those described above (subpar. c.(3)) will result. Use lubricants suitable for high temperatures. Inspect and clean the equipment daily. Take the precautions described in Chapter 2, Section IV, paragraph 27.

44. Parts of Radio Transmitting Set AN/FRT-22 Lubricated by Manufacturer

All parts which are to be lubricated, as shown in the lubricating instructions, have been lubricated by the manufacturer prior to the delivery of the equipment.

45. Parts of Radio Transmitting Set AN/FRT-22 Which Have Been Lubricated by the Manufacturer and Do Not Require Subsequent Lubrication

The bearings of the two blowers in Power Supply Assembly PP-1088/FRT-26 and in Power Supply Assembly PP-1089/FRT-22, and the bearings of the motors in each of the servo drive units are permanently lubricated and sealed, and do not require subsequent lubrication. Sealed, prelubricated ball bearings are also used at several points in the large plate-tank and coupling coil drive assemblies. Refer to par. 43 for specific lubrication instructions.

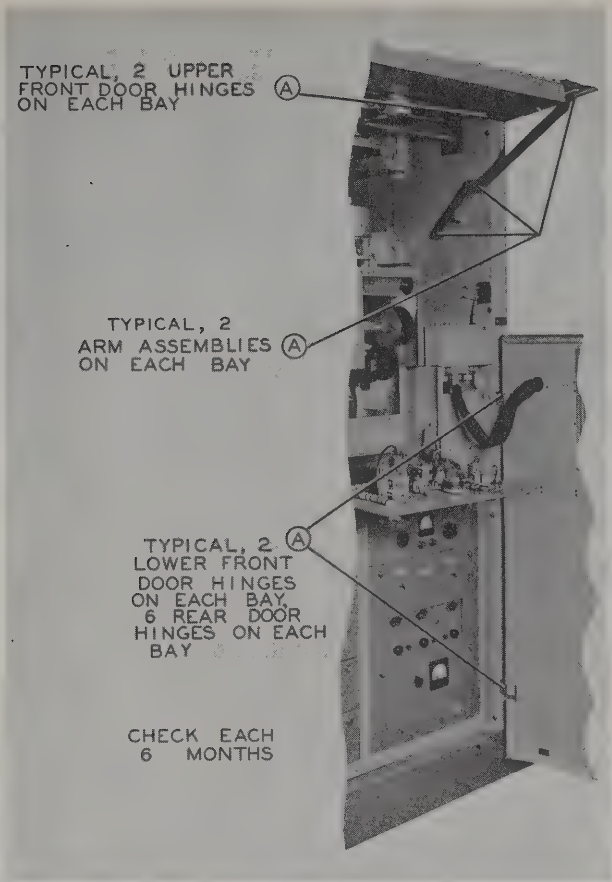


Figure 58. Lubrication of Door Hinges.

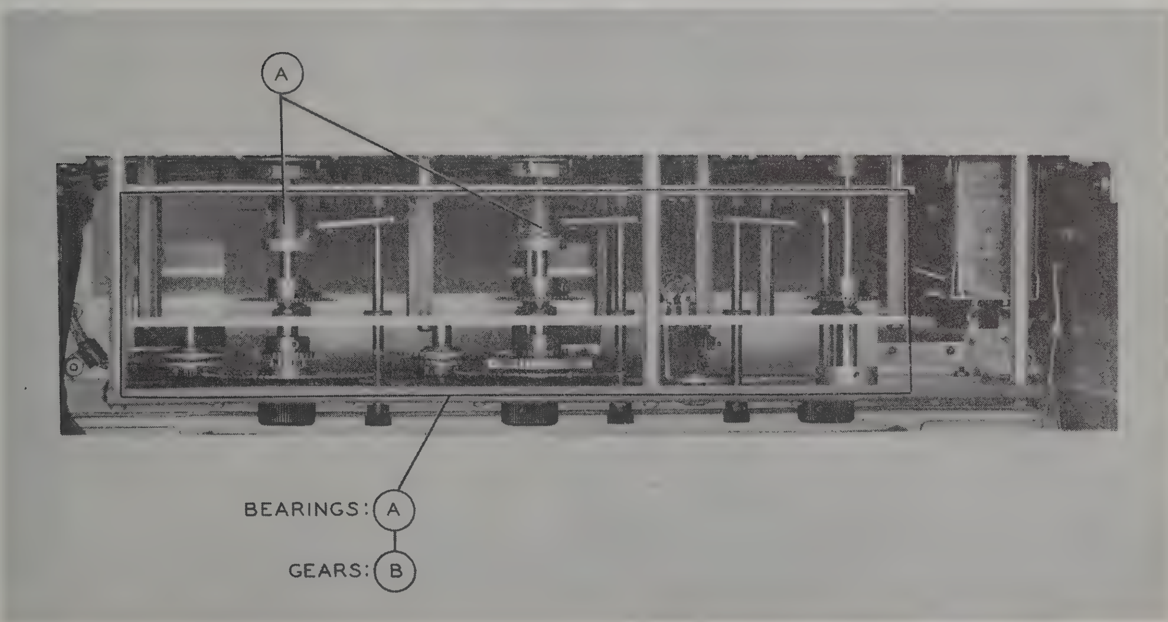


Figure 59. Lubrication of Dial Gears, R-F Oscillator O-91/FRT-5.

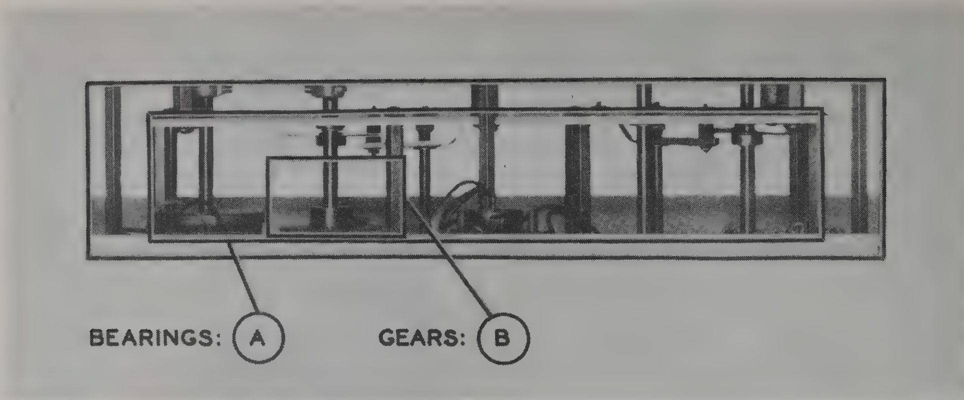


Figure 60. Lubrication of Dial Gears, Frequency-Shift Keyer KY-45/FRT-5.

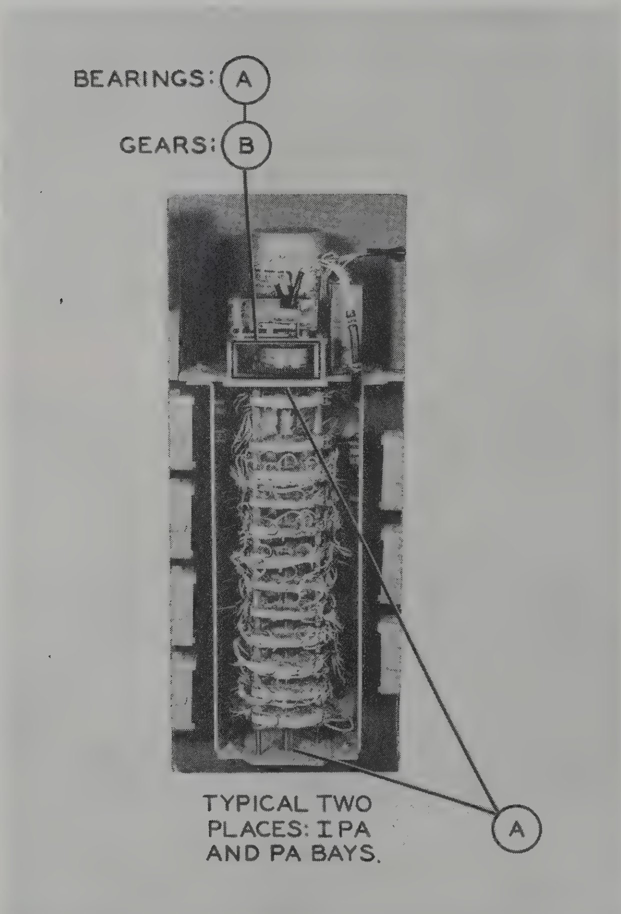


Figure 61. Lubrication of Channel-Selecting Autopositioner.

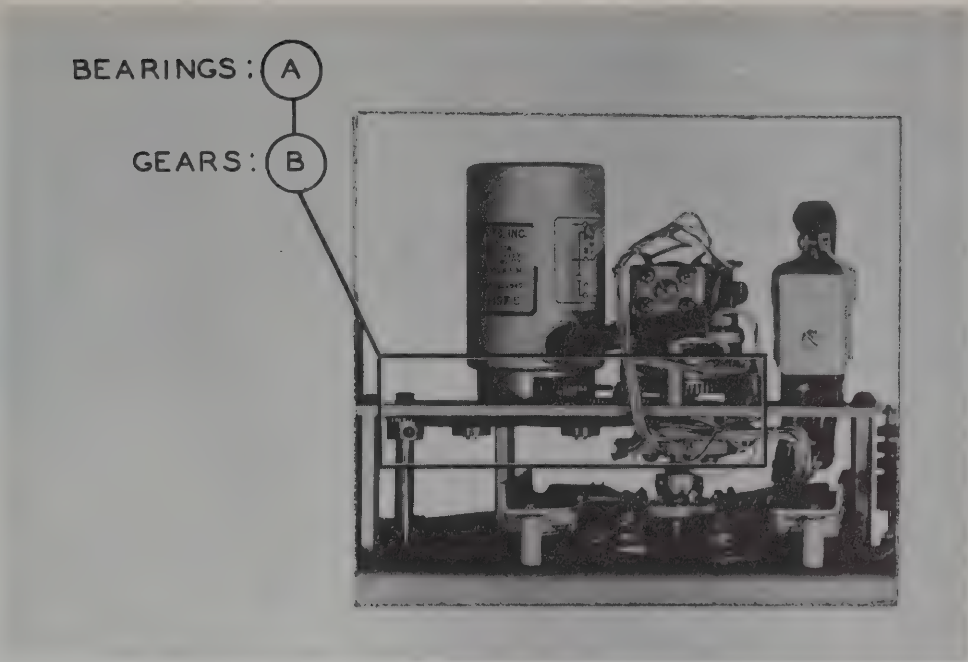


Figure 62. Lubrication of Crystal-Selector Autopositioner, R-F Oscillator O-270/FRT-26.

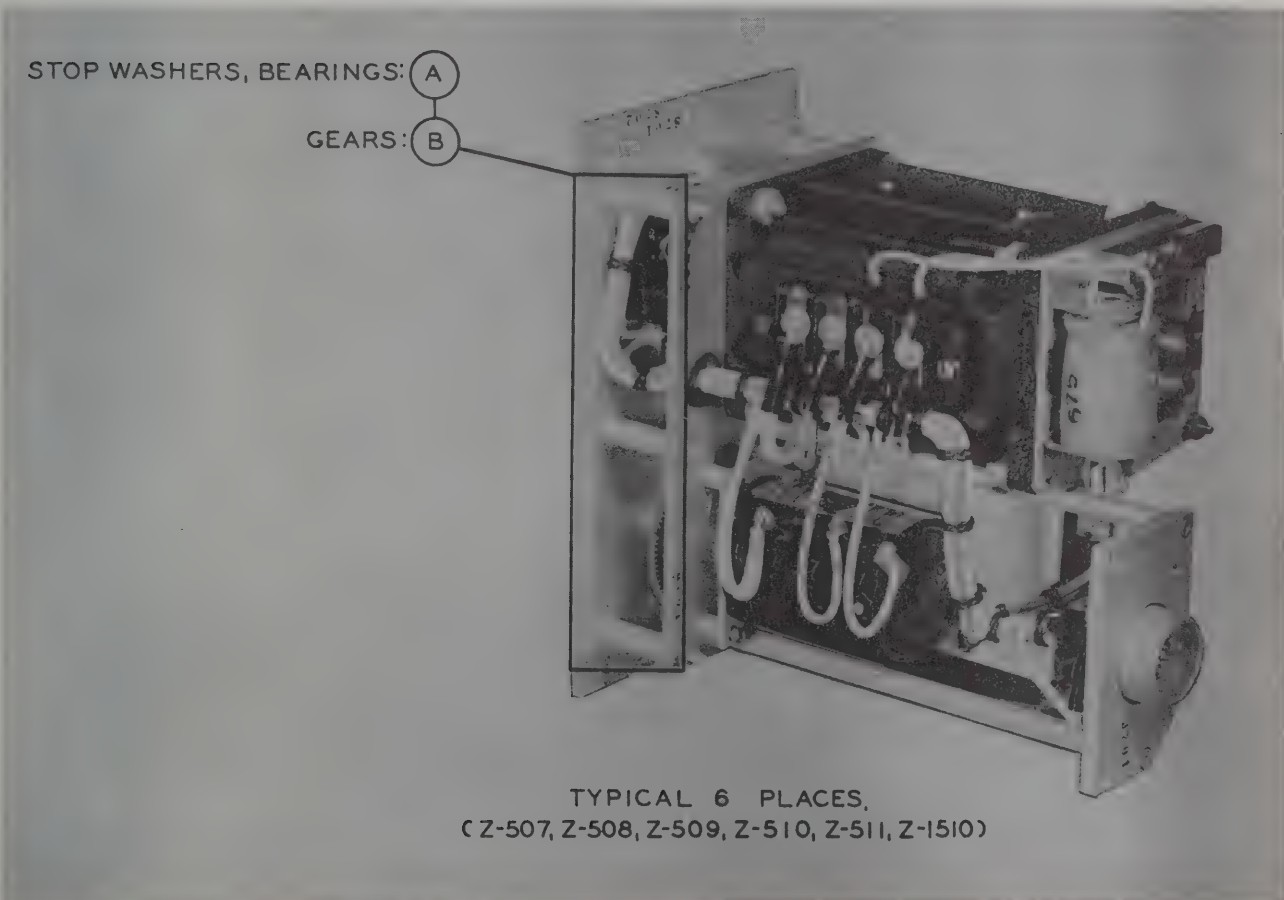


Figure 63. Lubrication of Servo Drive Unit.

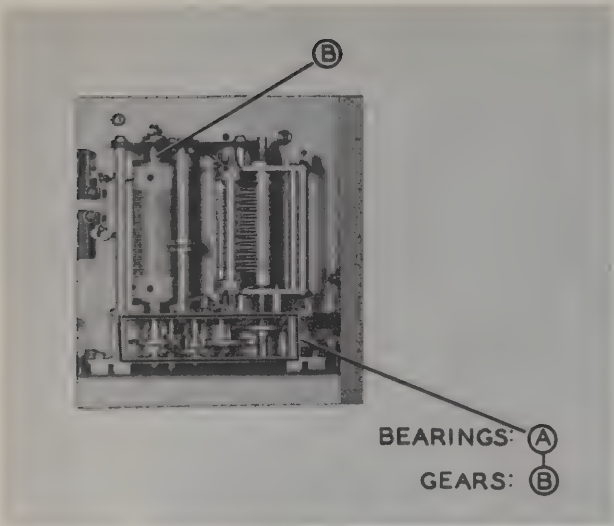


Figure 64. Lubrication of 1st Multiplier Plate Tank Drive Gears.

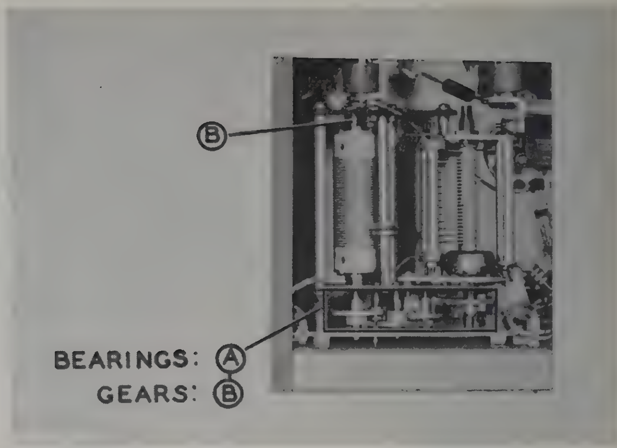


Figure 65. Lubrication of 2nd Multiplier Plate Tank Drive Gears.

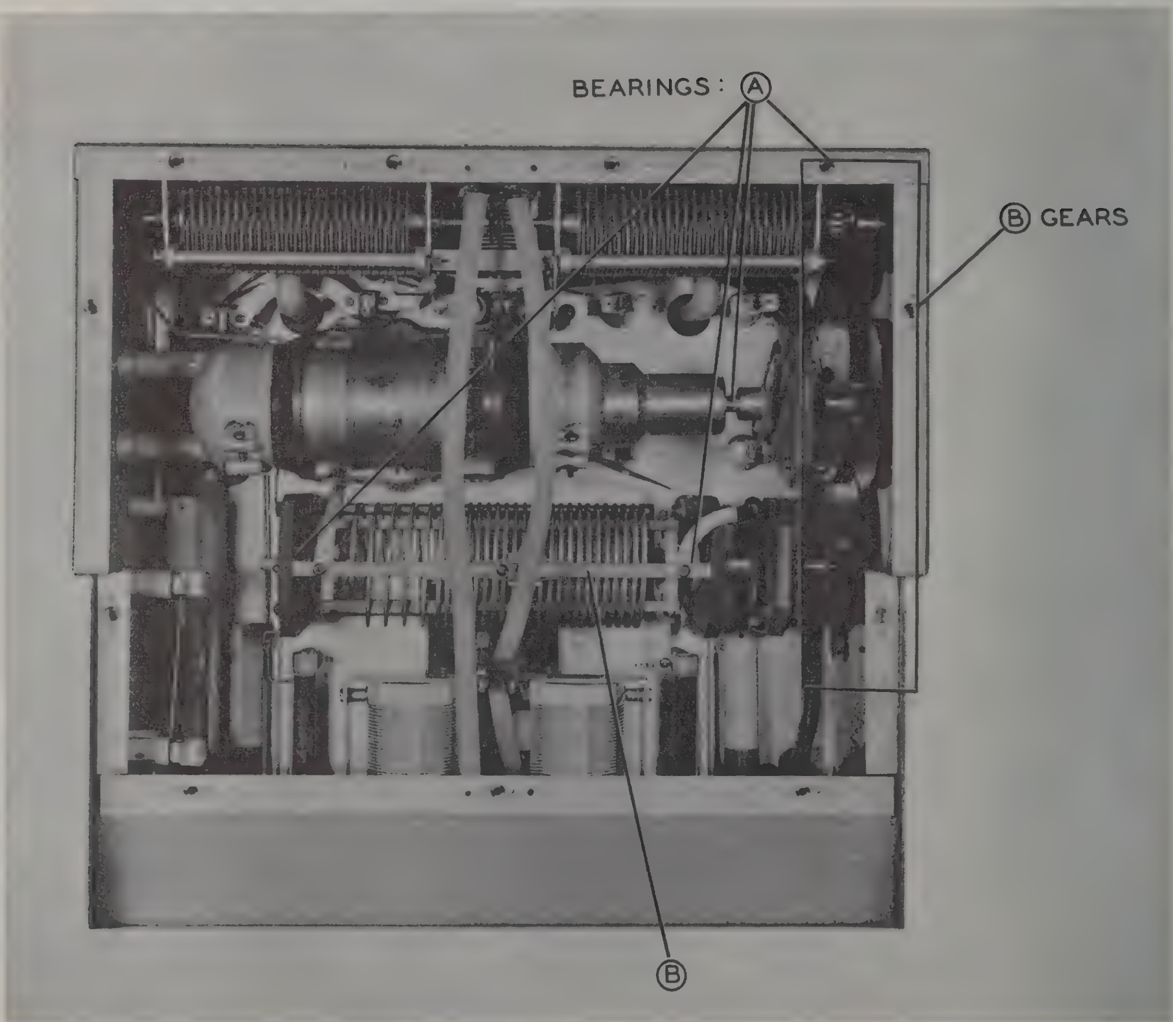


Figure 66. Lubrication of IPA Grid Box Gears and Variable Inductor.

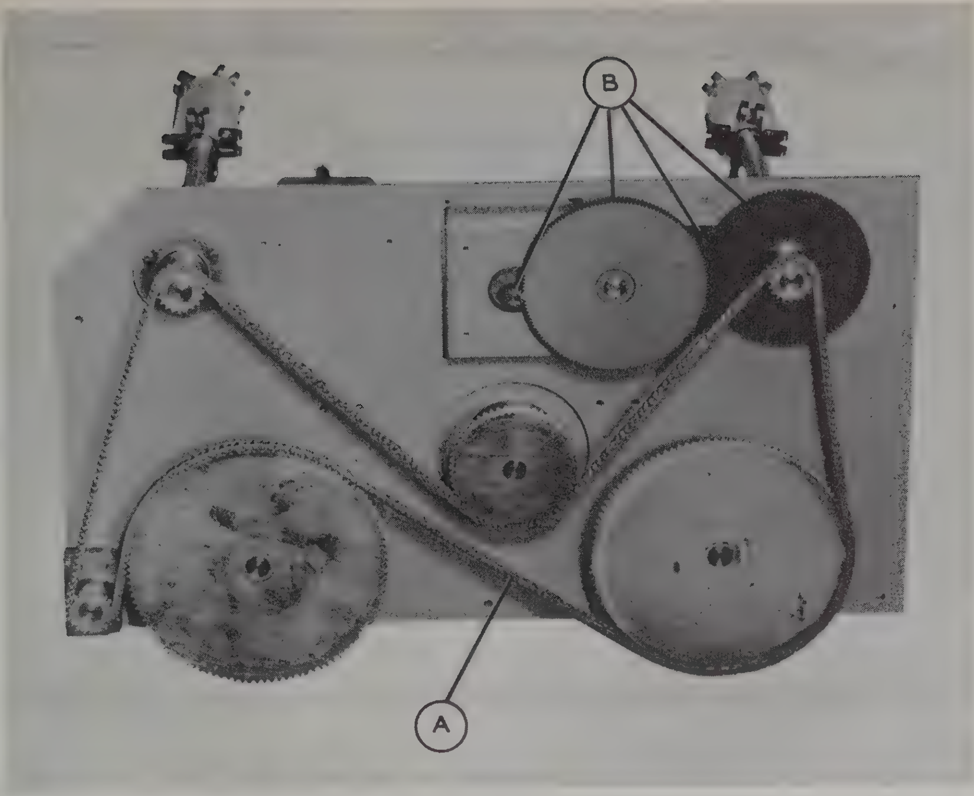


Figure 67. Lubrication of IPA Plate Tank Drive Assembly.

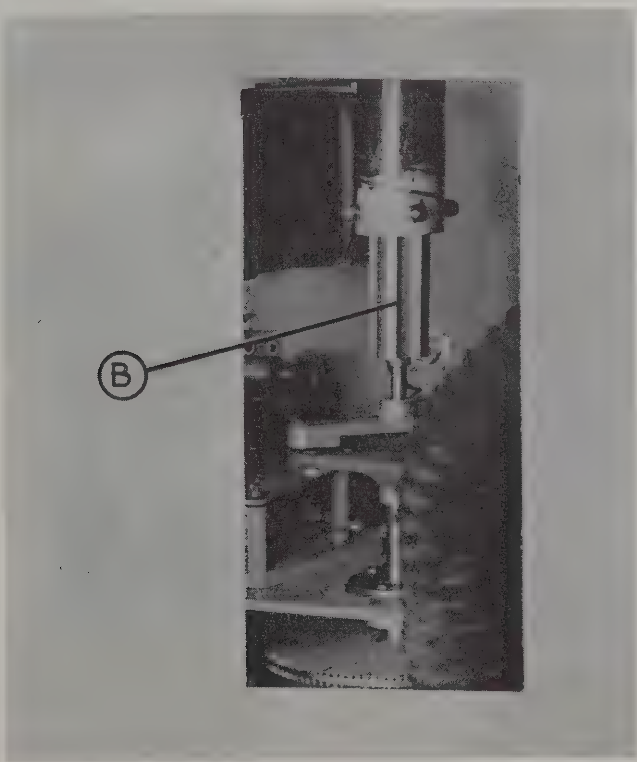


Figure 68. Lubrication of IPA Shorting Bar Guides.

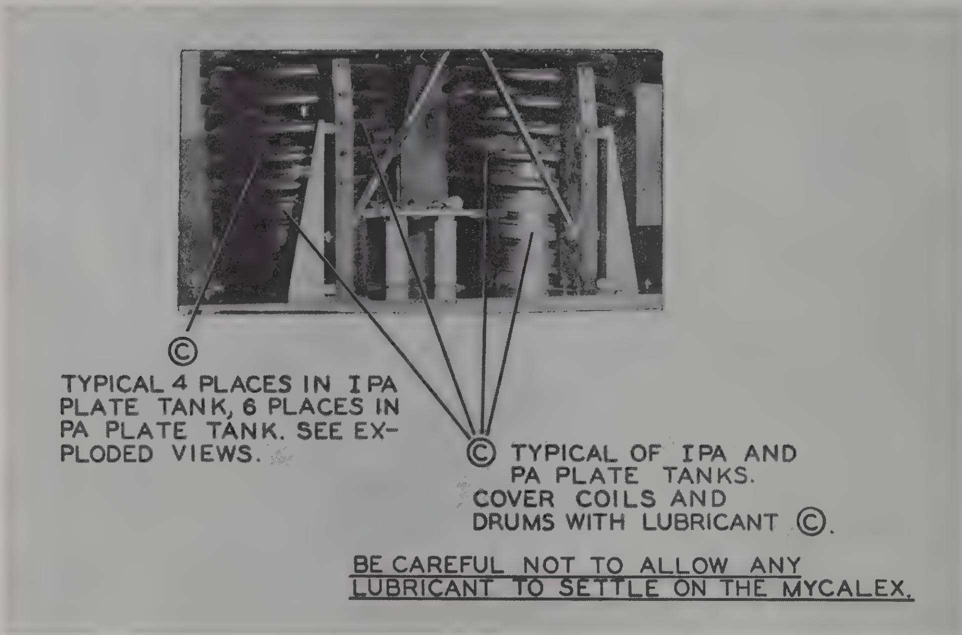


Figure 69. Lubrication of Plate Tank Drum Assembly.

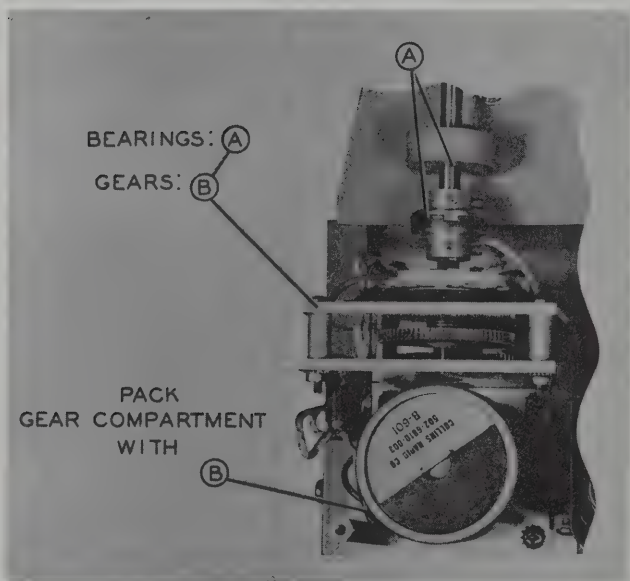


Figure 70. Lubrication of IPA Coupling Network Shorting Drive Unit.

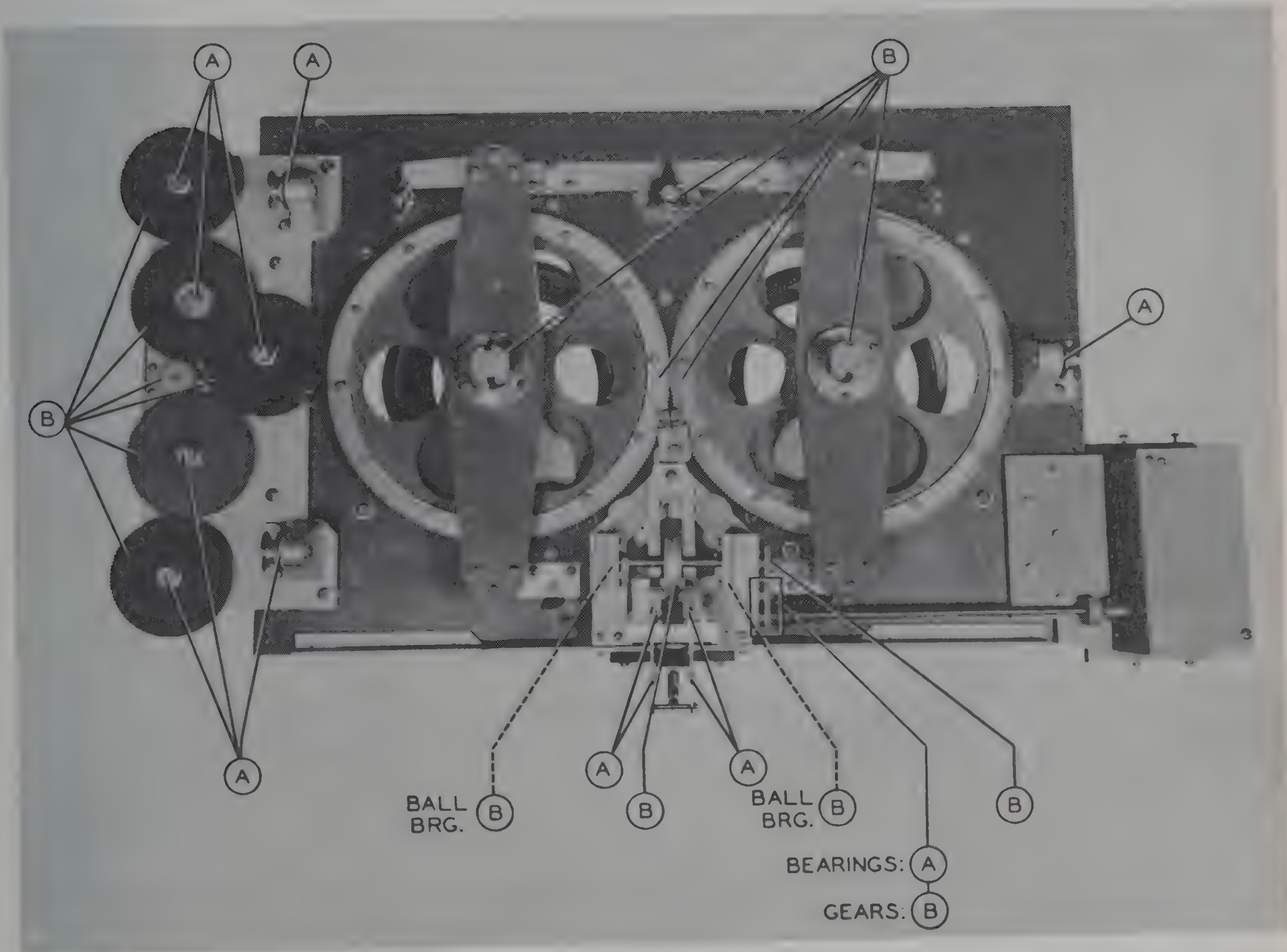


Figure 71. Lubrication of IPA Coupling Network, Top View.

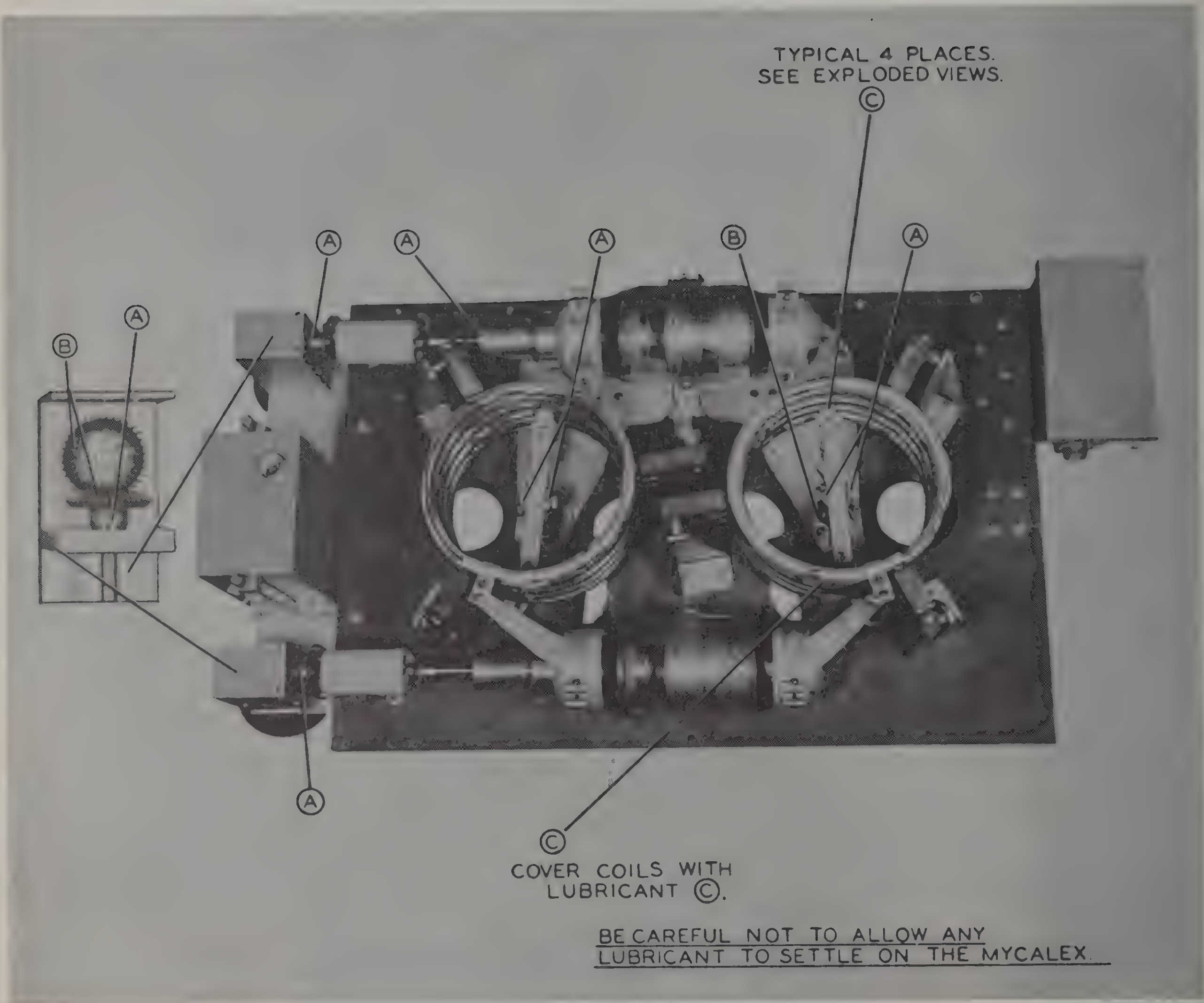


Figure 72. Lubrication of IPA Coupling Network, Bottom View.

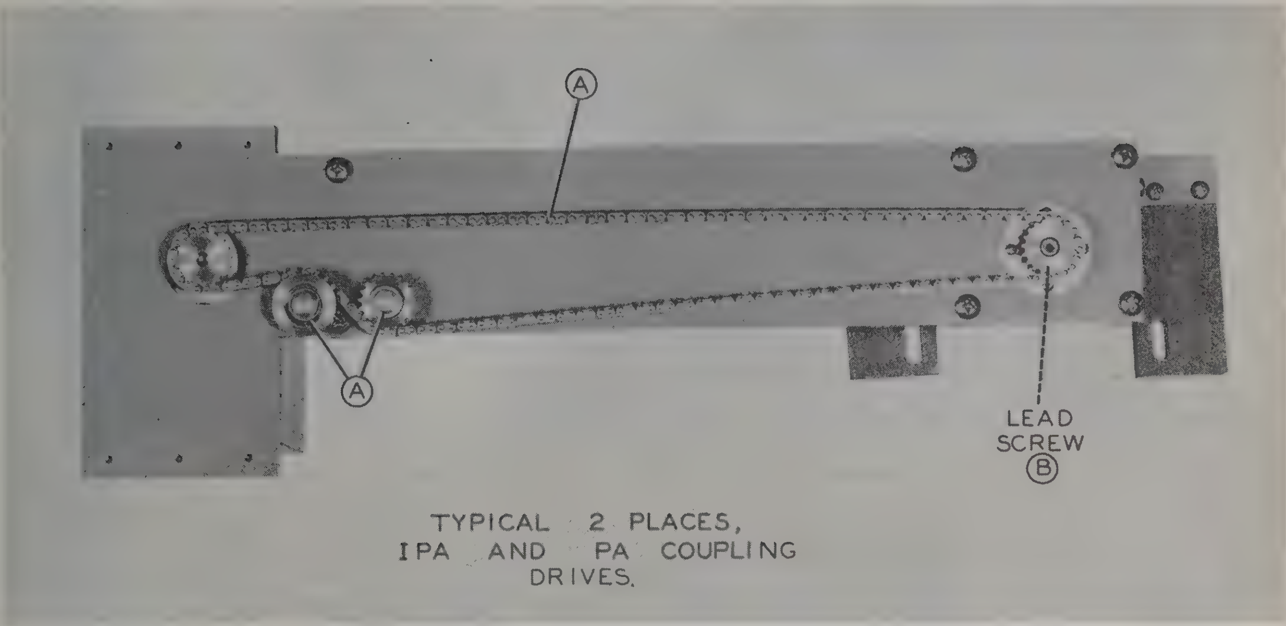


Figure 73. Lubrication of Coupling Network Platform Drive and Chain.

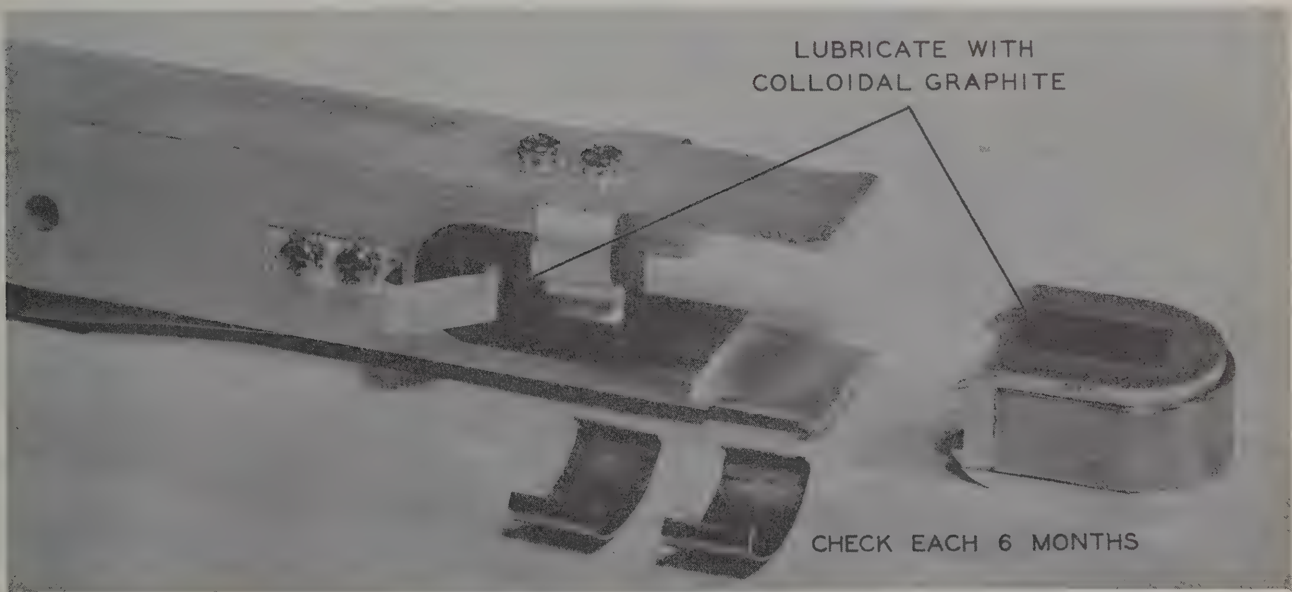


Figure 74. Lubrication of IPA Plate Tank Sliding Contact Assembly.

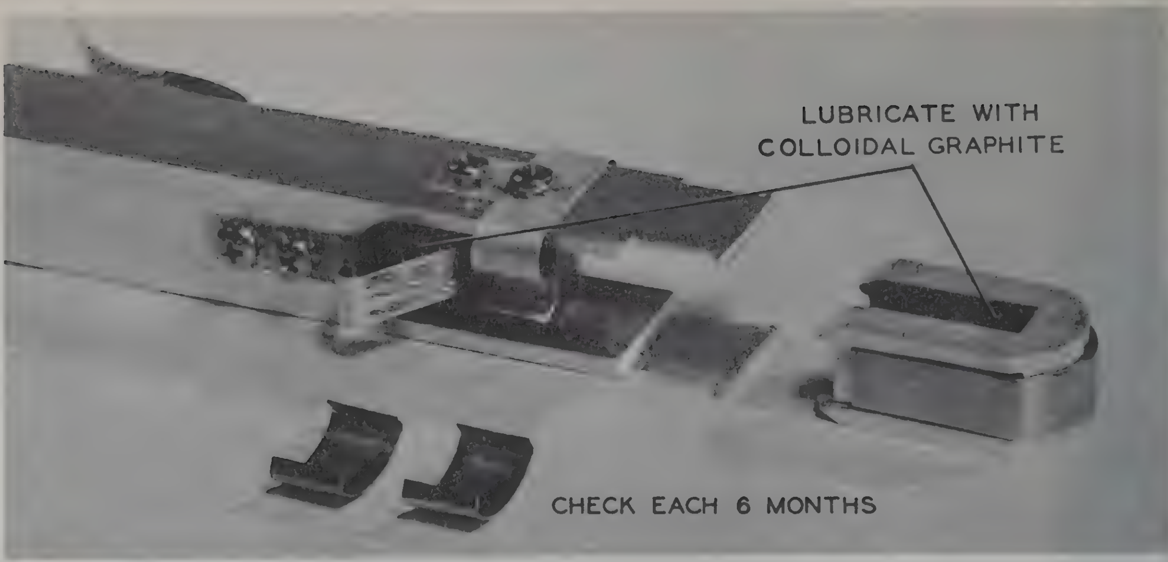


Figure 75. Lubrication of IPA Coupling Network Sliding Contact Assembly.

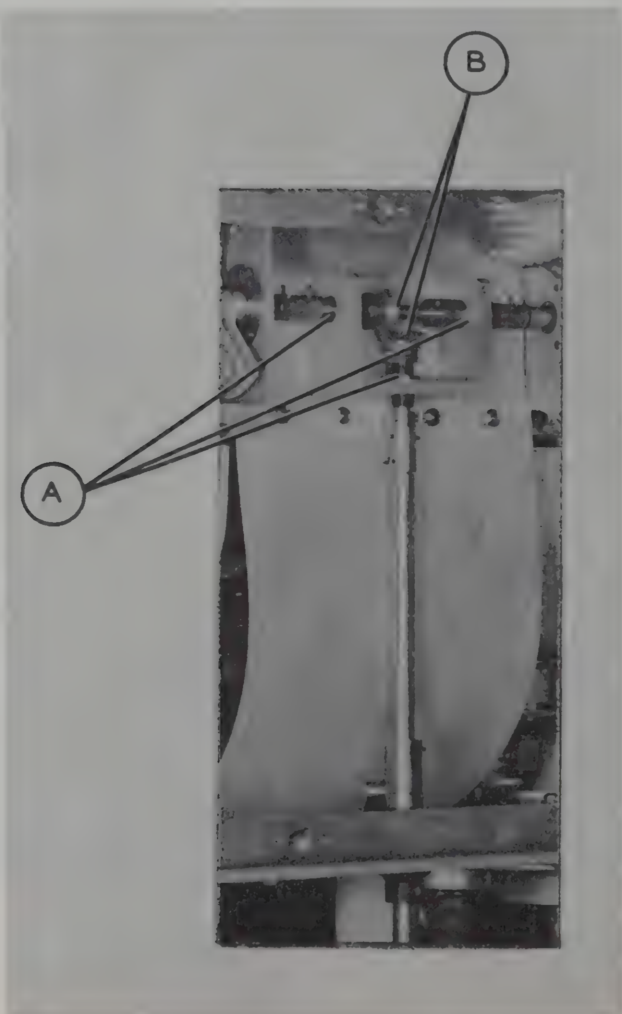


Figure 76. Lubrication of PA Input Capacity Drive Gears.

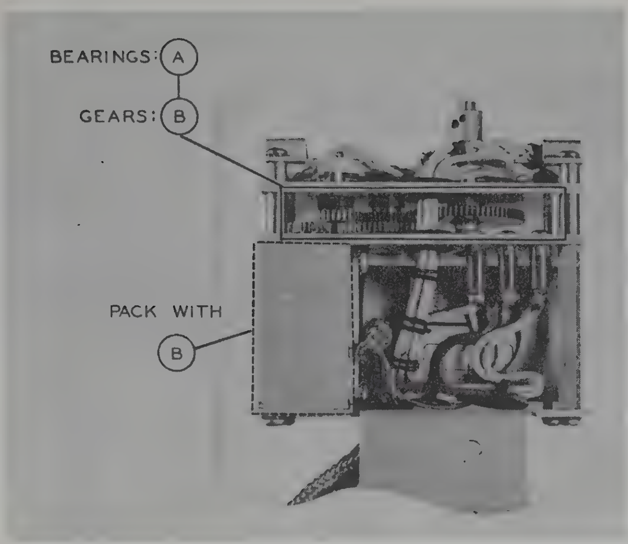


Figure 77. Lubrication of PA Input Capacity Drive Unit.

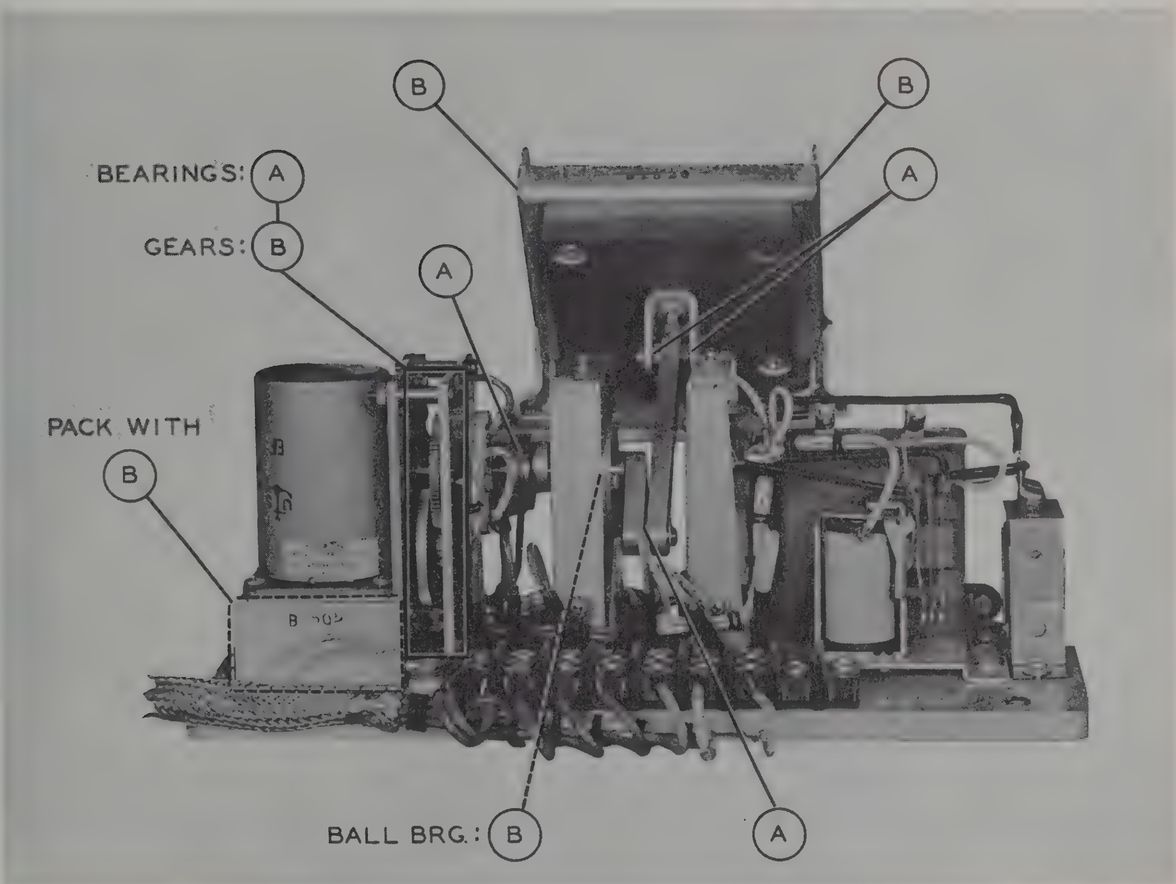


Figure 78. Lubrication of PA Plate Tank Shorting Drive Unit.

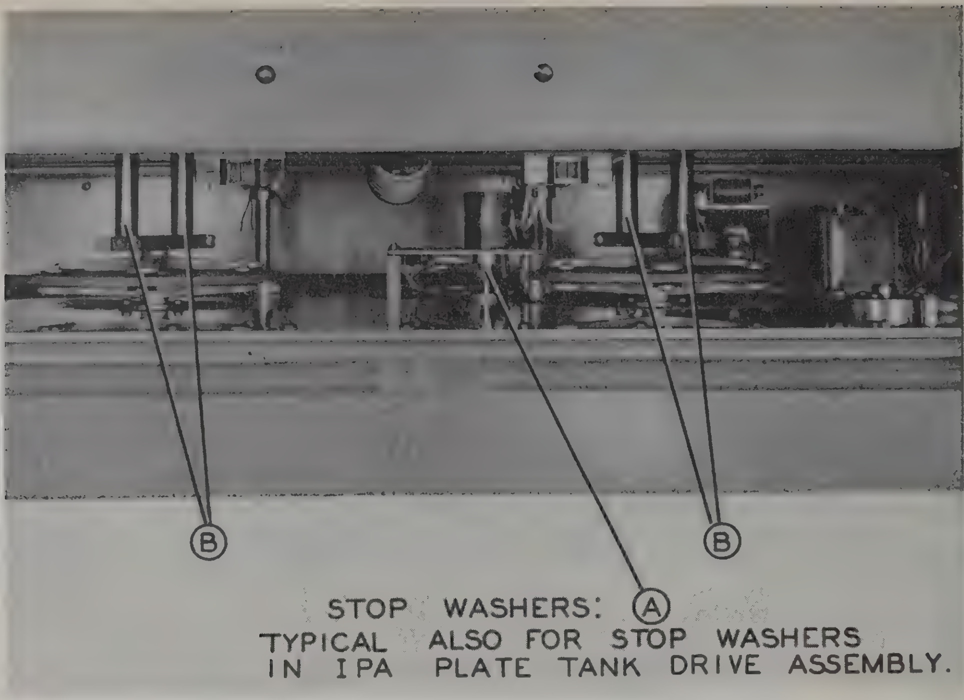


Figure 79. Lubrication of PA Plate Tank Drive Assembly and Shorting Bar Guides.

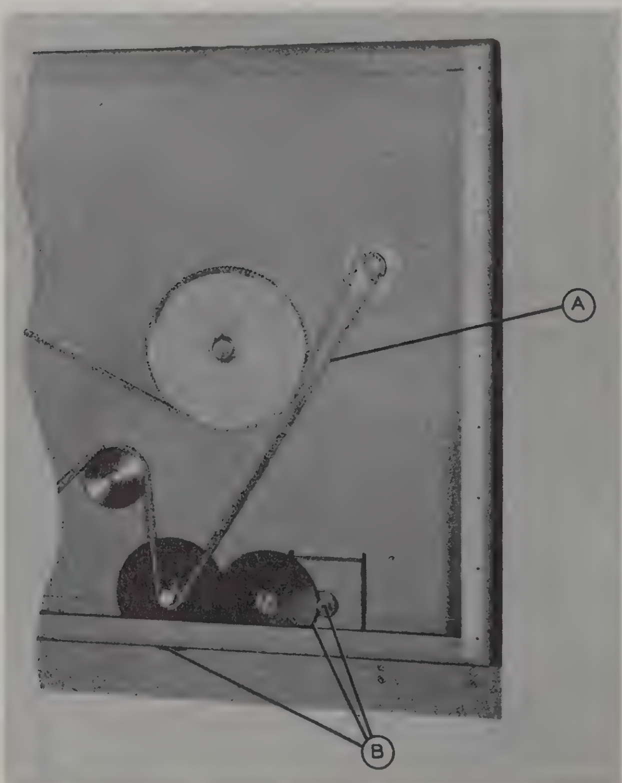


Figure 80. Lubrication of PA Plate Tank Drive Assembly, Bottom View.

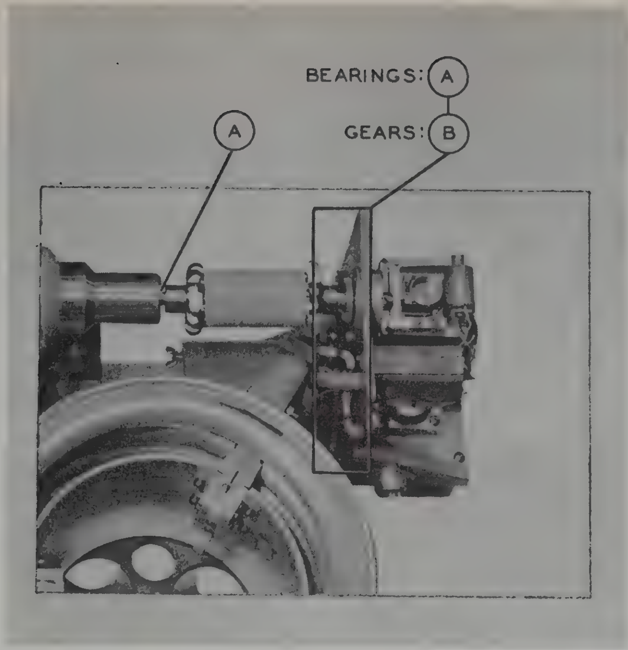


Figure 81. Lubrication of Antenna Coupling Network, Bottom View.

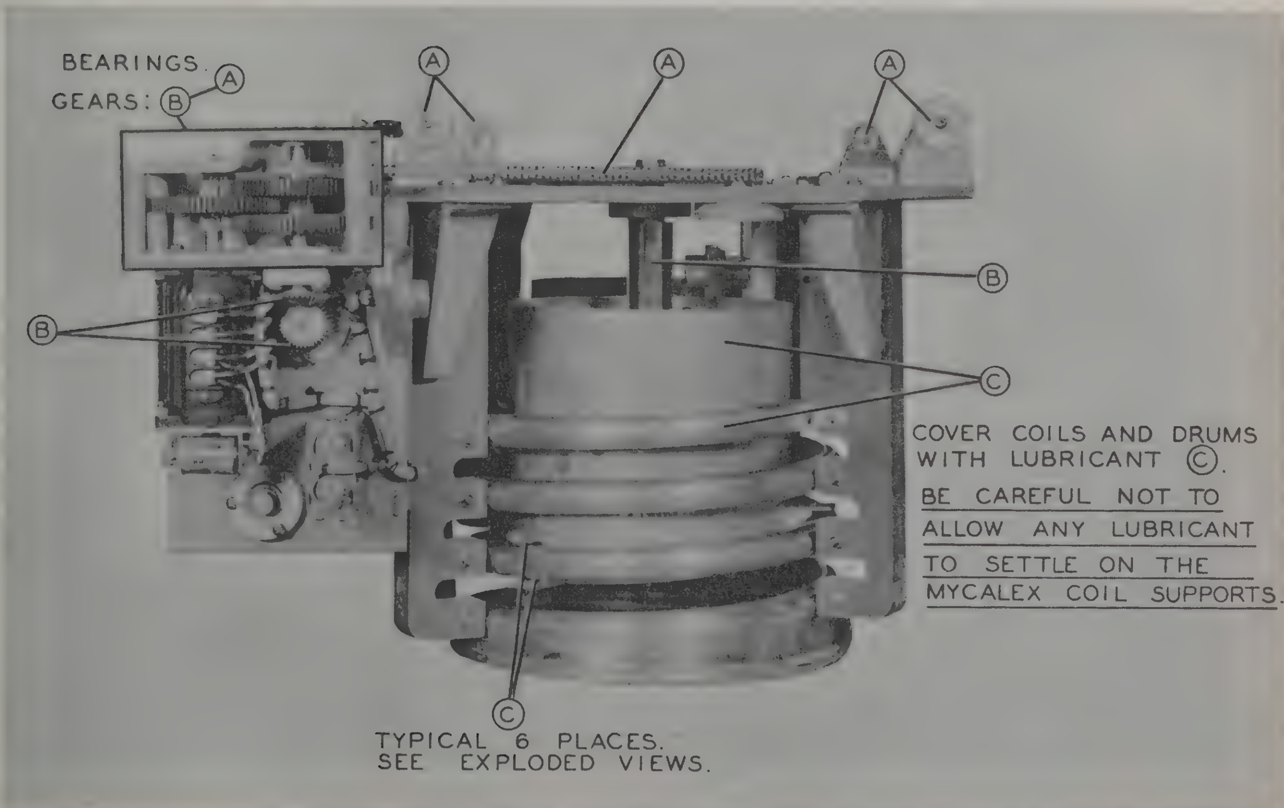


Figure 82. Lubrication of Antenna Coupling Network, Left-Side View.

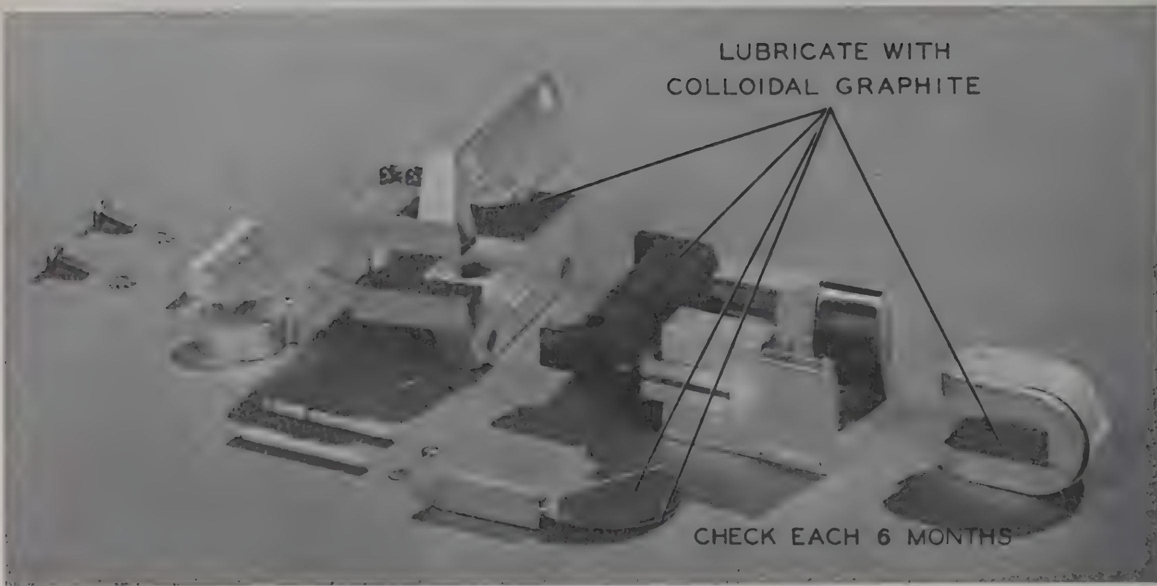


Figure 83. Lubrication of PA Plate Tank Sliding Contact Assembly.

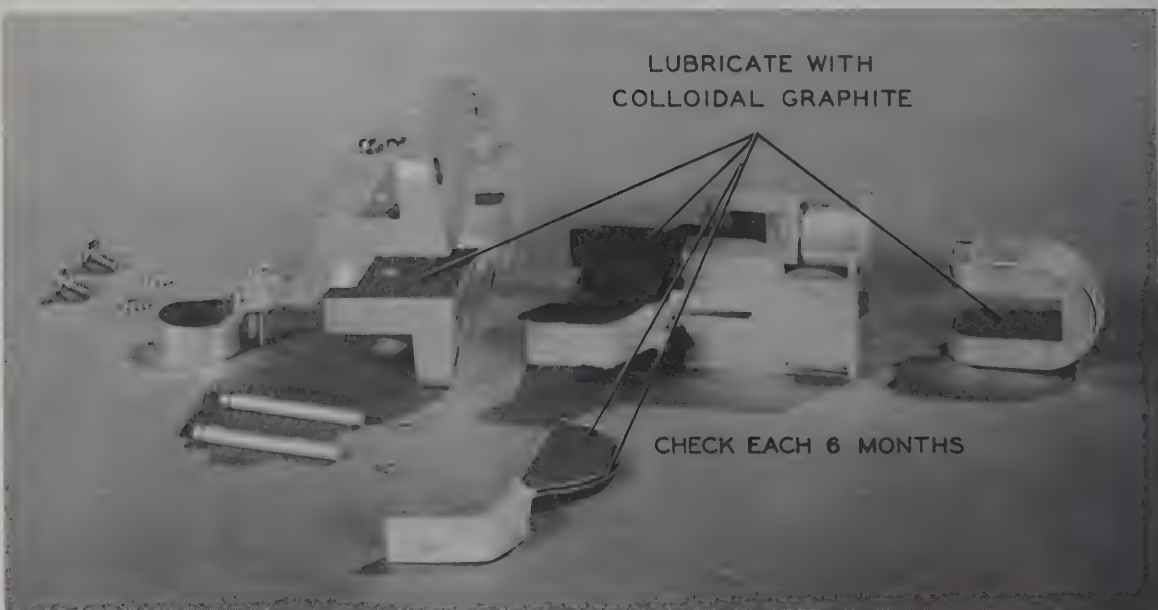


Figure 84. Lubrication of Antenna Coupling Network Sliding Contact Assembly.

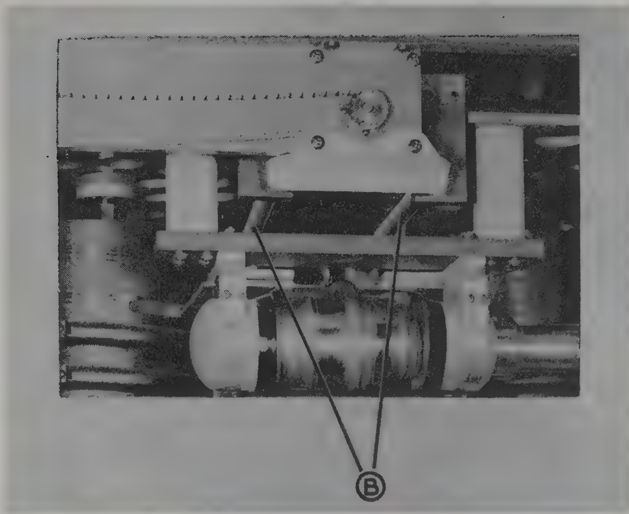


Figure 85. Lubrication of Antenna Contact Rods.

Figure 86. Lubrication of Typical Bearing, with Oil Cap.

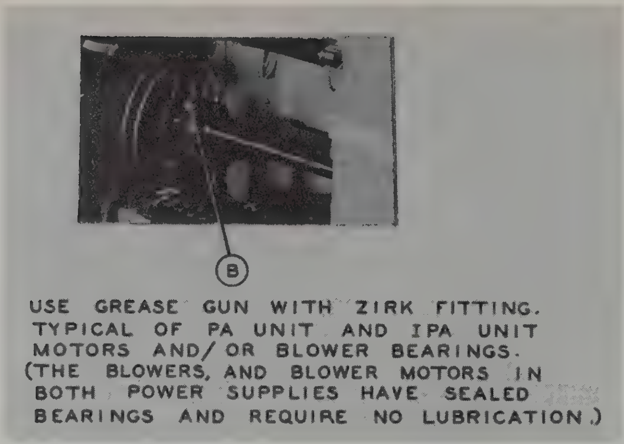


Figure 87. Lubrication of Typical Bearing, with Grease Fitting.

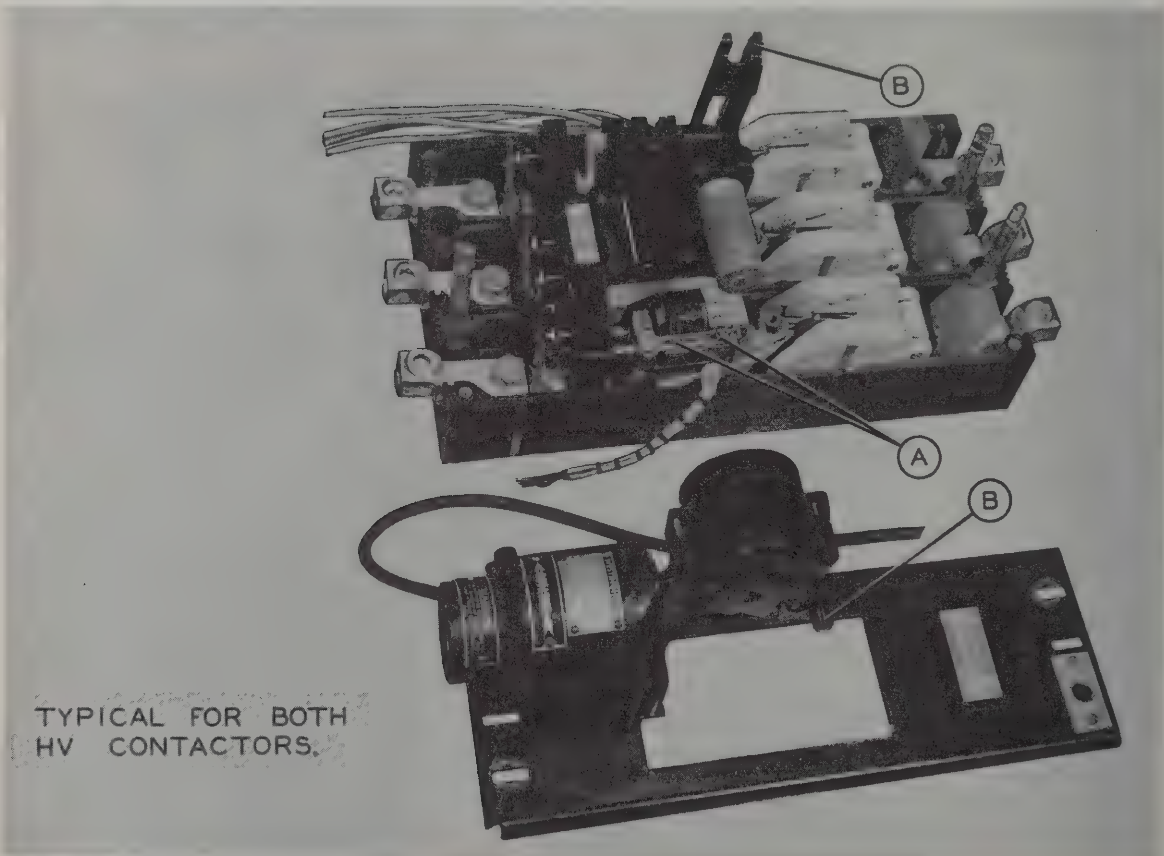


Figure 88. Lubrication of Main Breakers K-401 and K-1701.

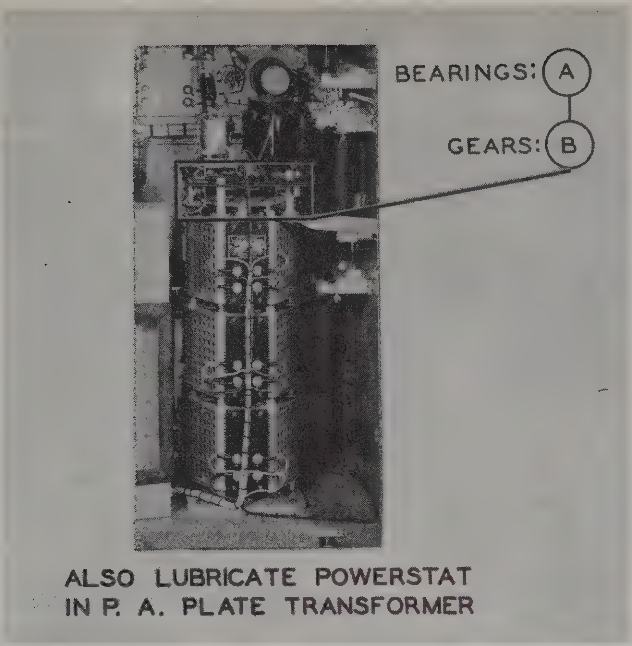


Figure 89. Lubrication of Powerstat Gears.

Section IV. WEATHERPROOFING

46. Weatherproofing

a. General. Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

b. Tropical Maintenance. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is fully explained in TB SIG 13 and TB SIG 72.

c. Desert Maintenance. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are fully explained in TB SIG 75.

d. Lubrication. The effects of extreme cold and heat on materials and lubricants are explained in TB SIG 69. Observe all precautions outlined in TB SIG 69, and pay strict attention to all lubrication instructions when operating equipment under conditions of extreme cold or heat. Refer to Section III of this chapter for lubrication instructions.

47. Rustproofing and Painting

a. When the finish on the case has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces. Use #00 or #000 sandpaper to clean the surface down to the bare metal; obtain a bright, smooth finish.

Caution: Do not use steel wool. Minute particles frequently cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. Remove rust from the case by cleaning corroded metal with solvent (SD). In severe cases it may be necessary to use solvent (SD) to soften the rust and to use sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations. Refer to TM 0-2851.

Section V. TROUBLE SHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

48. General

a. The trouble shooting and repair work that can be performed at the organizational maintenance level (operators and repairmen) is necessarily limited in scope by the tools, test equipment, and replaceable parts issued, and by the existing tactical situation. Accordingly, trouble shooting is

based on the performance of the equipment and the use of the senses in determining such troubles as burned-out tubes, cracked insulators, etc.

b. The paragraphs which follow in this section help in determining which of the components is at fault and in localizing the fault in that component to the defective stage or item, such as a tube or fuse.

c. Failure of this equipment to operate properly will usually be caused by one or more of the following faults:

(1) Improper tuning or adjustment.
(2) Defective tube.
(3) Blown fuse.
(4) Short circuit (caused by broken insulation, dangling wires, etc.).
(5) Dirty or pitted relay contacts.
(6) Inactive (dirty or cracked) crystal.
(7) Loose wires.
(8) Loose plugs and connectors.

d. When failure is encountered and the cause is not immediately apparent, check as many of the above items as is practicable before starting a detailed examination of the component parts of the system. If possible, obtain information from the operator of the equipment regarding performance at the time trouble occurred.

e. Visually inspect the antenna system for obvious faults.

49. System Sectionalization of Trouble to a Component

System sectionalization consists of determining whether the trouble is in the power supply circuits, the control circuits, or the r-f circuits, and then further localizing the trouble to determine from which minor unit or circuit the trouble arises.

a. If the entire transmitter is dead and cannot be started, the power has failed.

b. If one of the power supplies fails and the supply cannot be turned on, shut down the equipment and inspect the fuses associated with that supply. Do not replace blown fuses until the cause of the trouble has been determined and remedied. If the fuses are all right, inspect the circuit breakers in the power supply circuit for sticking armatures, loose connections, pitted or burned contacts, etc. Refer to Chapter 5, Section II, for repair procedures.

c. If the transmitter r-f output is low, erratic, or otherwise abnormal according to readings of the r-f voltmeters and the antenna current meters, and the power supply voltages are normal, inspect the PA deck, the IPA, the exciter stages, and the oscillator for burned-out tubes, gassy tubes, overheated tubes, arc-overs, or other abnormal conditions. Check meter indications in the r-f stages. Look for loose connections. Do not operate the transmitter longer than is necessary to localize the trouble, and if the trouble appears to be serious and likely to damage the equipment, shut the transmitter down until thorough checks can be made by a competent repairman using the proper test equipment.

d. If one or more of the power controls fails to perform its functions, inspect the connectors and contactors associated with the control for broken leads, inoperative relays, pitted contacts, etc.

e. By means of procedures similar to the checks above, the trouble can usually be isolated to a particular unit or part. Make use of the various test meters and the status indicators (relay flags, pilot lamps, etc.) to localize troubles.

50. Trouble Shooting by Using the Equipment Performance Checklist

a. General. The equipment performance checklist (par. 51) will help the operator to locate troubles in the equipment. The list gives the item to be checked, the conditions under which the item is checked, the normal indications and tolerances of correct operation, and the corrective measures the operator can take. To use this list, follow the items in numerical sequence.

b. Action or Condition. For some items, the information given in the action or condition column consists of various switch and control settings under which the item is to be checked. For other items it represents an action that must be taken to check the normal indication given in the normal indications column.

c. Normal Indications. The normal indications listed include the visible and audible signs that the operator should perceive when he checks the items. If the indications are not normal, the operator should apply the recommended corrective measures.

d. Corrective Measures. The corrective measures listed are those the operator can make without making extensive repairs. A reference in the table to chapter 5 indicates that the trouble cannot be corrected during operation and that trouble shooting by an experienced repairman is necessary. If the transmitter is completely inoperative or if the recommended corrective measures do not yield results, trouble shooting is necessary. However, if the tactical situation requires that communication be maintained, and if the set is not completely inoperative, the operator must maintain the set in operation as long as it is possible to do so.

51. Equipment Performance Checklist

a. R-F Oscillator O-91/FRT-5 and Power Supply PP-454/FRT-5.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	PREPARATORY			
1	Input and interconnecting cables	See Chapter 2, Paragraphs 11. and 12.	CRYSTAL OVEN HEAT ON lamp I-101 lights intermittently.	Check F-102.
2	Switch S-1002	Set at 230V. position.		
3	100-KC EXT-INT switch S-105	Set at INT position.		
4	SET UP-OPERATE switch S-103	Set at OPERATE position.	AFC ON lamp I-104 lights.	Check F-101.
5	LOW LEVEL FILAMENT breaker S-304	Operate to ON position.		
	STARTING			
6	ON-OFF switch S-1001	Operate to ON position.	POWER lamp I-1001 lights.	Check S-315, F-403, F-404, F-405.
7	PLATE ON-OFF switch S-101	Operate to ON position.	PLATE lamp I-102 lights.	Check F-1001, F-1003.
	OPERATION			
8	Headphones	Insert plug in jack J-103.	AFC motor B-101 runs to center capacitor C-126; AFC lamp goes out.	Check F-101.
9	MASTER OSCILLATOR control L-103	Set to desired frequency.		
10	INTERPOLATION OSCILLATOR control L-105	Set to difference between MASTER OSCILLATOR reading and nearest lower 5 kc point.		
11	OUTPUT TUNING control C-120	Set to desired frequency.	A tone should be heard in the headphones.	Refer to Chapter 5.
12	MASTER OSCILLATOR control L-103	Adjust for low-pitched tone.		
13	OUTPUT TUNING control C-120	Adjust for loudest tone.		
14	Headphones	Remove plug.	AFC lamp lights; AFC motor runs.	Refer to Chapter 5.
	STOPPING			
15	PLATE ON-OFF switch S-101	Operate to OFF position.	PLATE lamp I-102 goes out.	

b. Frequency-Shift Keyer KY-45/FRT-5.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	PREPARATORY			
1	Power input and interconnecting cables	See Chapter 2, Paragraphs 11. and 12.	OVEN HEAT lamp I-1401 lights.	Check F-1401, F-1402.
2	EXT OSC INPUT jack J-1401	Supply an r-f signal input of a frequency 200 kc higher than desired keyer output frequency.		
3	EXT OSC ATTENUATOR control S-1401	Set to 0 db.		
4	METER 807 switch S-1402	Set at GRID position.		
5	PHASE MODULATION control R-1485 and S-1408	Set to OFF position.		
6	TEST-OPERATE switch S-1403	Set to CARRIER position.		
	STARTING			
7	PLATE switch S-1409	Operate to ON position.	PLATE ON lamp I-1402 lights.	Check F-1002, F-1004.
	OPERATION			
8	MAIN TUNING control C-1405	Tune to lower sideband resonant peak.	Meter M-1401 indicates a peak.	Refer to Chapter 5.
9	OUTPUT LEVEL control R-1430	Set for desired output level.		
10	EXT OSC ATTENUATOR control S-1401	Adjust for 1.5 ma 807 grid current.	Meter M-1401 indicates 1.5 ma.	
11	OUTPUT LEVEL control R-1430	Reset for desired output level.		
12	METER 807 switch S-1402	Turn to PLATE position.		
13	BASIC SHIFT control R-1464	Rotate to 0.		
14	External frequency-measuring equipment	Adjust to desired keyer output frequency.	A beat note should be heard.	
15	200-KC OSC. ADJUST control C-1442	Adjust for zero beat.		
16	TRANSMITTER MULTIPLICATION switch S-1405	Set to the position indicating multiplication factor to be used.		

Item	Action or condition	Normal indications	Corrective measures
OPERATION (contd)			
BASIC SHIFT control R-1464	Refer to curve, Fig. 50; set control for desired frequency shift.		
TEST-OPERATE switch S-1403	Set at SPACE position.	A beat note should be heard.	Refer to Chapter 5.
External audio signal generator	Set for one-half the desired carrier shift divided by multiplication factor.		
BASIC SHIFT control R-1464	Zero beat with audio generator frequency.		
TEST-OPERATE switch S-1403	Set to MARK position.	Resulting note should be zero beat with audio generator frequency.	Refer to Chapter 5.
KEY LINE jack J-1407	Apply mark keying signal.		
TEST-OPERATE switch S-1403	Operate to FSK position.	Resulting note should be near zero beat with audio generator frequency.	
LIMITER ADJUST control R-1439	Adjust for exact zero beat with audio generator.		
PHASE MODULATION control R-1485, S-1408	Operate from minimum to maximum several times.	"Wobbulation" should increase as control is advanced.	Refer to Chapter 5.
STOPPING			
PLATE switch S-1409	Operate to OFF position.	PLATE ON lamp I-1402 goes out.	

ıary Power Control System.

Item	Action or condition	Normal indications	Corrective measures
PREPARATORY			
Power input and interconnecting cables	See Chapter 2, Paragraphs 11. and 12.	CRYSTAL HEATER lamp I-1103 on R-F Oscillator O-270/FRT-26 lights intermittently. FILAMENT lamp I-1102 lights.	

Item No.	Item	Action or condition	Normal indications	Corrective measures
	PREPARATORY (contd)			
2	Plate transformer connections	Check phasing against cabling diagrams.		
3	PA CONTROL switch S-1608	Turn to OFF position.		
4	Blower hold-on timer K-305	Set for 5 minutes.		
5	Non-automatic restart interval timer K-312	Set for 30 seconds.		
6	Automatic restart interval timer K-316	Set for 10 minutes.		
7	Automatic shutdown time delay timer K-323	Set for 15 minutes.		
8	RECYCLE SELECTOR switch S-317	Set to position 3.		
9	Overload relays K-324 and K-325	Set at 2.5 amp.		
10	Overload relay K-319	Set at 5 amp.		
11	Overload relay K-326	Set at 0.4 amp.		
12	Bias interlock relay K-307	Set at 0.25 amp.		
13	Filament time delay timer K-1614	Set for 30 seconds.		
14	Blower hold-on timer K-1615	Set for 5 minutes.		
15	Overload relays K-1601 thru K-1606	Set at 3 amp.		
16	Bias interlock relay K-1608	Set at 0.75 amp.		
17	Overload relay K-1607	Set at 12 amp.		
	EQUIPMENT PERFORMANCE			
18	All circuit breakers and red FILAMENT-EMERGENCY SHUT-DOWN toggle switches	Operate to OFF position.		
19	LOW LEVEL FILAMENT breaker S-304	Operate to ON position.		

Type No.	Type	Action or condition	Normal indications	Corrective measures
	EQUIPMENT PERFORMANCE (contd)			
20	FILAMENT - EMERGENCY SHUT DOWN switches S-307 and S-510	Operate to ON position.	All low-level filaments in Radio Transmitter T-454/FRT-26 light. FILAMENT lamp I-304 lights. Rectifier filaments light.	Refer to Chapter 5. Check S-315, F-403, F-404, F-405.
21	METER SWITCH S-314	Operate to position 1, 2, or 3.	LINE VOLTAGE meter M-302 reads near 230V.	
22	Primary voltage - adjust rheostat R-355	Adjust for 230 volt indication on LINE VOLTAGE meter M-302. Allow 20 seconds for delay timer to operate.	After approximately 20 seconds, powerstat operates to correct voltage according to setting of R-355.	Refer to Chapter 5.
23	BLOWER breaker S-301	Operate to ON position.	Blowers in Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26 start.	Refer to Chapter 5.
24	Blower hold-on timer K-305	Allow to operate for 5 minutes.	After 5 minutes, blowers stop.	Refer to Chapter 5.
25	FILAMENT - EMERGENCY SHUT DOWN switch S-307 or S-510	Operate to OFF momentarily, then ON again	Blowers restart.	Refer to Chapter 5.
26	P.A. FILAMENT breaker S-305	Operate to ON position.	Filaments of V-505 and V-506 light. FILAMENT lamp I-505 lights.	Refer to Chapter 5.
27	METER SWITCH S-314	Turn to position 4.	P.A. FILAMENT meter M-303 reads approximately 7.5 volts.	
28	LEFT P.A. FILAMENT rheostat R-327	Adjust for 7.5 volt indication on P.A. FILAMENT meter M-303.		
29	METER SWITCH S-314	Turn to position 5.	P.A. FILAMENT meter M-303 reads approximately 7.5 volts.	
30	RIGHT P.A. FILAMENT rheostat R-326	Adjust for 7.5 volts indication on P.A. FILAMENT meter M-303.		

Item No.	Item	Action or condition	Normal indications	Corrective measures
	EQUIPMENT PERFORMANCE (contd)			
31	BLOWER breakers S-301	Operate to OFF position.	Filaments of V-505 and V-506 go off before blowers stop turning.	Refer to Chapter 5.
32	BLOWER breaker S-301	Operate to ON position.	Blowers restart. Filaments of V-505 and V-506 light.	Refer to Chapter 5.
33	DELTA-WYE-OFF switch S-401	Operate to OFF position.		
34	Bias interlock relay K-307	Block plunger up (Contacts in closed position) with cardboard or other material.		
35	CONTROL CIRCUIT breaker S-303	Operate to ON position.	Meter lights in IPA and IPA power supply light.	Refer to Chapter 5.
36	Upper front door	Open and close again.	K-306 opens and closes.	Refer to Chapter 5.
37	TUNE-OPERATE switch S-310	Operate to LV TUNE position.		
38	PLATE ON button S-309 or S-519	Depress.	Relay K-308 operates.	Refer to Chapter 5.
39	TUNE-OPERATE switch S-310	Operate to H.V. TUNE position.	Main breaker K-401 closes audibly. HV PLATE lamp I-306 and P. A. PLATE lamp I-506 light.	Refer to Chapter 5.
40	TUNE-OPERATE switch S-310	Operate to OPERATE position.	Tune-resistor shorting contactor K-402 operates. Hv warning lamps I-401 and I-402 light.	Check F-401 and F-402. Refer to Chapter 5.
41	Overload relay K-319	Remove cover and, within 30 seconds after performing step 39, lift armature until contacts part. Use insulated tool.	Main breaker K-401 opens audibly and remains open. HV warning lamps I-401 and I-402, and H.V. PLATE lamps I-306 and I-506 go out. K-402 opens.	Refer to Chapter 5.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	EQUIPMENT PERFORMANCE (contd)			
42	PLATE ON button S-309 or S-519	Depress.	Main breaker K-401 closes. Tune-resistor shorting contactor K-402 closes. Hv warning lamps I-401 and I-402, and H.V. PLATE lamps I-306 and I-506 light.	Refer to Chapter 5.
43	Overload relays K-324, K-325, and K-326	Remove covers.		
44	Overload relay K-324	At least 30 seconds after performing step 42, lift armature as in step 41.	Plate circuit controls open, as indicated in step 41, and immediately reclose in the sequence indicated in step 42. OVERLOAD lamps light.	Refer to Chapter 5.
45	Overload relay K-325	Repeat step 44.	Same indication as step 44.	Refer to Chapter 5.
46	Overload relay K-326	Repeat step 44.	If more than 10 minutes has elapsed since step 44 was performed, the indication of step 44 is repeated. If 10 minutes has not elapsed, plate circuit controls open as in step 41, overload lockout alarm I-310 sounds, and OVERLOAD lamps go out.	
47	PLATE OFF button S-308 or S-520	Depress.	Horn stops.	
48	P.A. CONTROL switch S-1608	Operate to ON position.		
49	FILAMENT - EMERGENCY SHUT DOWN switches S-1505 and S-1606	Operate to ON position.		
50	RECT. FILAMENT breaker S-1604	Operate to ON position.	FILAMENT lamp I-1604 lights. Rectifier filaments in PA power supply light.	Refer to Chapter 5.
51	METER SWITCH S-1621	Turn to position 1, 2, or 3.	LINE VOLTAGE meter M-1602 reads 230 v.	Refer to step 22.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	EQUIPMENT PERFORMANCE (contd)			
52	BLOWER breaker S-1601	Operate to ON position.	Blowers in PA and PA power supply start.	Refer to Chapter 5.
53	Blower hold-on timer K-1615	Allow to operate for 5 minutes.	After 5 minutes, blowers stop.	Refer to Chapter 5.
54	FILAMENT - EMERGENCY SHUT DOWN switch S-1505 or S-1606	Operate to OFF momentarily, then ON again.	Blowers restart.	Refer to Chapter 5.
55	P. A. FILAMENT breaker S-1605	Operate to ON position.	Filaments of PA tubes light. FILAMENT lamp I-1505 lights.	Refer to Chapter 5.
56	METER SWITCH S-1621	Operate to position 4.	P. A. FILAMENT VOLTAGE meter M-1603 reads approximately 7.5 volts.	
57	LEFT P. A. FILAMENT rheostat R-1639	Adjust for 7.5 volt indication on P. A. FILAMENT VOLTAGE meter M-1603.		
58	METER SWITCH S-1621	Operate to position 5.	P.A. FILAMENT VOLTAGE meter M-1603 reads approximately 7.5 volts.	
59	RIGHT P. A. FILAMENT rheostat R-1640	Adjust for 7.5 volt indication on P. A. FILAMENT VOLTAGE meter M-1603.		
60	BLOWER breaker S-1601	Operate to OFF position.	Filaments of PA tubes go off before blowers stop turning.	Refer to Chapter 5.
61	BLOWER breaker S-1601	Operate to ON position.	Blowers restart. Filaments of PA tubes light.	Refer to Chapter 5.
62	FILAMENT - EMERGENCY SHUT DOWN S-1505 or S-1606	Operate to OFF position momentarily, then ON again.	Filaments of PA tubes go out when switch is off. Filaments of IPA tubes remain on.	Refer to Chapter 5.
63	FILAMENT - EMERGENCY SHUT DOWN switch S-307 or S-510	Operate to OFF position momentarily, then ON again.	Filaments of both PA and IPA tubes go out when switch is off.	Refer to Chapter 5.
64	PA power supply rectifiers	Remove tube plate cap connectors. Assure that caps hang free.		

Item No.	Item	Action or condition	Normal indications	Corrective Measures
	EQUIPMENT PERFORMANCE (contd)			
65	BIAS breaker S-1602	Operate to ON position.		
66	CONTROL CIRCUIT breaker S-1603	Operate to ON position.	Meter lights in PA and PA power supply light. Bias undervoltage relay K-1608 closes, shows orange indicator flag. BIAS PLATE lamps I-1506 and I-1605 light.	Refer to Chapter 5.
67	Upper front door	Open and close again.	K-1608 opens and closes. BIAS PLATE lamps go out and light again.	Refer to Chapter 5.
68	P. P. PLATE VOLTAGE control S-1622	Operate to RAISE position and hold.	After a time, HIGH LIMIT lamp I-1608 lights.	Refer to Chapter 5.
69	P. A. PLATE VOLTAGE control S-1622	Operate to LOWER position and hold.	After a time, LOW LIMIT lamp I-1609 lights.	Refer to Chapter 5.
70	TUNE-OPERATE switch S-310	Operate to L.V. TUNE position.		
71	PLATE ON button S-1508 or S-1609	Depress.	Main breaker K-1701 closes audibly. H.V. PLATE lamps I-1606 and I-1507 light. Hv warning lamps I-1701 and I-1702 light.	Check F-1701 and F-1702. Refer to Chapter 5.
72	Overload relays K-1601, K-1602, K-1603, K-1604, K-1605, K-1606, K-1607	Remove covers.		
73	RECYCLE SELECTOR switch S-317	Set to position 6.		
74	PLATE OFF button S-1509 or S-1610	Depress.	Main breaker K-1701 opens. H.V. PLATE lamps I-1507 and I-1606 go out. Hv warning lamps I-1701 and I-1702 go out.	
75	PLATE ON button S-1508 or S-1609	Depress.	Same indication as step 71.	

Item No.	Item	Action or condition	Normal indications	Corrective measures
	EQUIPMENT PERFORMANCE (contd)			
76	Overload relay K-1601	Within 30 seconds after performing step 75, lift armature with insulated tool until contacts part.	Same indication as step 74.	Refer to Chapter 5.
77	Overload relays K-1602, K-1603, K-1604, K-1605, and K-1606	At least 30 seconds after performing step 75, part the contacts of each of these relays in turn as in step 76.	Plate circuit controls open, as indicated in step 74, and immediately reclose, each time the relay contacts are opened. Overload lamps light.	Refer to Chapter 5.
78	Overload relay K-1607	Repeat step 77.	If more than 10 minutes has elapsed, since step 75 was performed, the indication of step 77 is repeated. If 10 minutes has not elapsed, plate circuit controls open as in step 74, overload lockout alarm I-310 sounds, and overload lamps go out.	
79	PLATE OFF button S-308 or S-520	Depress.	Horn stops.	Refer to Chapter 5.
	STOPPING			
80	All four FILAMENT - EMERGENCY SHUT DOWN switches	Operate to OFF position.	Filaments of IPA and PA and rectifiers go off. Blowers continue to run for 5 minutes, then stop.	Refer to Chapter 5.
81	All breakers	After blowers have stopped, operate to OFF position.	All transmitter circuits are off.	
82	PA power supply rectifiers.	Replace tube plate cap connectors.		

a. Servo Tuning System.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	PREPARATORY			
1	LOW LEVEL FILAMENT breaker S-304	Operate to ON position.		
2	FILAMENT - EMERGENCY SHUT DOWN switches S-307 and S-510	Operate to ON position.	FILAMENT lamp I-304 lights. Rectifier filaments and all low level filaments light.	Refer to Chapter 5.
	STARTING			
3	SERVO CONTROL breaker S-306	Operate to ON position.	POWER ON lamp I-901 on IPA servo power supply lights. Preset tuning control system and/or servo drive units of IPA unit may go into operation, should stop within approximately 50 seconds.	Check S-315, F-403, F-404, F-405.
4	SERVO CONTROL breaker S-1607	Operate to ON position.	POWER ON lamp I-901 on PA servo power supply lights. Preset tuning control system and/or servo drive units of PA unit may go into operation, should stop within approximately 50 seconds.	Check S-315, F-403, F-404, F-405.
	EQUIPMENT PERFORMANCE			
5	Channel selector switch S-524	Set to channel 1. If the control was previously set at channel 1, operate to another channel and immediately return to channel 1.	Preset tuning control circuits cycle. Channel indicator lamps I-513.1 and I-1510.1 light. Servo drive units run.	Check F-503, F-1502. Refer to Chapter 5.
6	Frequency multiplier chassis	Tilt forward for access to first multiplier stage, on left side of chassis.		
7	1st MULTIPLIER PLATE TUNING potentiometer R-651.1	Rotate through range.	Capacitor C-511 is fully meshed when dial reads zero, and drive unit operates smoothly as control is rotated.	Refer to Chapter 2 for servo adjustment procedure, Chapter 5 for corrective maintenance.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	EQUIPMENT PERFORMANCE (contd)			
8	2nd MULTIPLIER PLATE TUNING potentiometer R-652.1	Rotate through range.	Capacitor C-517 (right side of multiplier chassis) is just beginning to mesh when dial reads 1000, and drive unit operates smoothly as control is rotated.	Refer to Chapter 2, Chapter 5.
9	IPA grid box	Remove front cover.		
10	DRIVER PLATE TUNING potentiometer R-653.1	Rotate through range.	Slider on L-509 is on second turn from left end, air capacitors C-533 and C-534 are at minimum capacity, vacuum capacitor C-526 is approximately 1/2 turn from minimum capacity, when dial reads 1000. Drive unit operates smoothly as control is rotated.	Refer to Chapter 2, Chapter 5.
11	Intermediate POWER AMP. PLATE TUNING potentiometer R-654.1	Rotate through range.	Sliding contacts are on the top turns of their respective coils, the contact bars parallel when dial reads 1000. Drive unit operates smoothly as control is rotated.	Refer to Chapter 2, Chapter 5.
12	Intermediate POWER AMP. LOADING potentiometer R-655.1	Rotate through range.	Coupling platform is in maximum coupling position when dial reads 1000. Drive unit operates smoothly as control is rotated.	Refer to Chapter 2, Chapter 5.
13	ANT. (IPA coupling network) TUNING potentiometer R-656.1	Rotate through range.	Sliding contacts are on the top turns of their respective coils, the contact bars should be parallel, when dial reads zero. Drive unit operates smoothly as control is rotated.	Refer to Chapter 2, Chapter 5.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	EQUIPMENT PERFORMANCE (contd)			
14	ANT. (IPA coupling network) CAP. SHORT switch S-525.1	Operate to each of the three positions.	Shorting switch follows operation of control switch.	Refer to Chapter 5.
15	PLATE TUNING potentiometer R-1572.1	Rotate through range.	Sliding contacts are on the top turns of their respective coils, the contact drums in the same relative position when dial reads 1000. Drive unit operates smoothly as control is rotated.	Refer to Chapter 2, Chapter 5.
16	LOADING potentiometer R-1573.1	Rotate through range.	Coupling platform is in maximum coupling position (rearward) when dial reads 1000. Drive unit operates smoothly as control is rotated.	Refer to Chapter 2, Chapter 5.
17	ANTENNA TUNING potentiometer R-1571.1	Rotate through range.	Sliding contacts are on the top turns of their respective coils, the contact drums in the same relative position, when dial reads zero. Drive unit operates smoothly as control is rotated.	Refer to Chapter 2, Chapter 5.
18	INPUT CAPACITY switch S-1525.1	Rotate through all positions, consecutively, in both directions.	When control is turned clockwise, capacitor (in cathode compartment) turns in small increments, decreasing capacity at each step. When control is turned counterclockwise, capacitor turns nearly full revolution, increasing capacity with each step.	Refer to Chapter 5.
19	PLATE TANK SHORT switch S-1526.1	Operate switch to each position.	Shorting switch in rear of PA bay follows operation of control switch.	Refer to Chapter 5.
Note. Repeat steps 5 through 19 for each position of channel selector switch S-524.				

Item No.	Item	Action or condition	Normal indications	Corrective measures
	STOPPING			
20	SERVO CONTROL breakers S-306 and S-1607	Operate to OFF position.	POWER ON lamps I-901 go out.	

e. R-F Circuits.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	PREPARATORY			
1	All circuit breakers	Operate to ON position	Meter lamps light. POWER ON lamps in servo power supplies light.	Check S-315, F-403, F-404, F-405. Refer to Chapter 5.
2	Patch panel	Connect J-1201 and J-1202 with a patch cable.		
3	TUNE-OPERATE switch S-310	Operate to L.V. TUNE position.		
4	Channel selector switch S-524	Operate to desired channel.	Preset tuning control circuits cycle. Channel indicator lamps light. Servo drive units run.	Refer to Chapter 5.
5	EXCITATION SELECTOR switch S-527	Set at CW position.		
	STARTING			
6	FILAMENT-EMERGENCY SHUT DOWN switches	Operate all four switches to ON position.	All tube filaments light. FILAMENT lamps light. BIAS lamps light after filament heating time delay has elapsed.	Refer to Chapter 5.
7	Tuning controls for channel to be used	Set according to calibration curves, figs. 39 through 47.	Servo drive units operate to follow control actions.	Refer to Chapter 2.
8	KEYING SELECTOR switch S-501	Operate to LOCAL position.		
9	TEST KEY S-316, S-521, S-1503, or S-1620	Operate to locking (upper) position.		

Item No.	Item	Action or condition	Normal indications	Corrective measures
	STARTING (contd)			
10	PLATE ON button S-519	Depress.	LV PLATE lamp I-305 lights.	
	TUNING			
11	Meter switch S-1103	Operate to OSC.CATH. and BUFF. CATH. positions.	Oscillator cathode current: 8 to 8.5 ma. Buffer cathode current: 30 to 35 ma.	Check inter unit cables. Check F-1101. Refer to Chapter 5.
12	EXCITER TEST switch S-503	Operate to position 1.	EXCITER TEST meters M-505 and M-506 show current readings.	Check F-501. Refer to Chapter 5.
13	EXCITER TEST switch S-503	Operate to position 2.	EXCITER TEST meters M-505 and M-506 show current readings.	Check F-501. Refer to Chapter 5.
14	1st MULTIPLIER PLATE TUNING potentiometer R-651	Tune for maximum indication on EXCITER TEST NO. 2 meter M-506.	Refer to Typical Meter Readings, paragraph 24.	
15	EXCITER TEST switch S-503	Operate to position 3.	EXCITER TEST meters M-505 and M-506 show current readings.	Check F-502. Refer to Chapter 5.
16	2nd MULTIPLIER PLATE TUNING potentiometer R-652	Tune for maximum indication on EXCITER TEST NO. 2 meter M-506	Refer to Typical Meter Readings, paragraph 24.	Adjust R-F EXCITATION control R-519 for required current reading.
17	EXCITER TEST switch S-503	Operate to position 4.	EXCITER TEST meter M-505 shows voltage reading.	Refer to Chapter 5.
18	DRIVER PLATE TUNING potentiometer R-653	Tune for maximum indication on EXCITER TEST NO. 1 meter M-505.		
19	Intermediate P.A. TEST switch S-504	Operate to position 3.	P. A. TEST meter M-506 shows current reading.	Refer to Chapter 5.
20	TUNE OPERATE switch S-310	Operate to H.V. TUNE position.	Main breaker K-401 closes audibly. H.V. PLATE lamps I-306 and P. A. PLATE lamp I-506 light.	If K-401 closes and immediately opens, perform step 21 quickly. Refer to Chapter 5.
21	Intermediate POWER AMP. PLATE TUNING potentiometer R-654	Tune for minimum indication on TOTAL P. A. PLATE meter M-502.		Refer to Chapter 5.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	TUNING (contd)			
22	DRIVER PLATE TUNING potentiometer R-653	Tune through resonance.	IPA grid current peak occurs at the same time as driver plate current dip.	Refer to Chapter 5.
23	Intermediate POWER AMP. PLATE TUNING potentiometer R-654	Tune through resonance.	IPA grid current peak occurs at the same time as IPA plate current dip.	Refer to Chapter 5.
24	TUNE-OPERATE switch S-310	Operate to OPERATE position.	Tune-resistor shorting contactor K-402 closes audibly. H.V. warning lamps I-401 and I-402 light.	Refer to Chapter 5.
25	Intermediate POWER AMP. PLATE TUNING potentiometer R-654	Retune for minimum indication on TOTAL P.A. PLATE meter M-502.		
26	ANT. TUNING potentiometer R-656, Intermediate POWER AMP. PLATE TUNING potentiometer R-654, and intermediate POWER AMP. LOADING potentiometer R-655	Tune ANT. TUNING control for maximum indication on TOTAL P.A. PLATE meter M-502; simultaneously readjust POWER AMP. PLATE TUNING for minimum indication. At the same time, reduce POWER AMP. LOADING if necessary to prevent the power amplifier grid current, as indicated on TOTAL GRID CURRENT meter M-1503, from rising to more than 2.5 amp.		
27	P.A. PLATE VOLTAGE control S-1622	Operate to LOWER position; hold until green LOW LIMIT lamp I-1609 lights. Release.		
28	PLATE ON button S-1508 or S-1609	Depress.	Main breaker K-1701 closes audibly. H.V. PLATE lamps I-1507 and I-1606 light.	Refer to Chapter 5.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	TUNING (contd)			
			P.A. PLATE VOLTAGE meter reads approximately 3000 volts.	
29	PLATE TUNING potentiometer R-1572	Tune for minimum indication on TOTAL PLATE CURRENT meter M-1501.		
30	LOADING potentiometer R-1573	Set between 0 and 200 dial reading.		
31	ANTENNA TUNING potentiometer R-1571, PLATE TUNING potentiometer R-1572, and LOADING potentiometer R-1573	Tune ANTENNA TUNING control for maximum indication on TOTAL PLATE CURRENT meter M-1501; simultaneously readjust PLATE TUNING control for minimum indication. Increase or decrease LOADING as necessary to get a good indication.		
32	P.A. PLATE VOLTAGE control S-1622	Operate to RAISE position; hold until P. A. PLATE VOLTAGE meter M-1601 reads approximately 5500 volts.		
33	LOADING potentiometer R-1573 and intermediate POWER AMP. LOADING potentiometer R-655	Increase LOADING until TOTAL PLATE CURRENT meter M-1501 reads approximately 7 amp; simultaneously adjust intermediate POWER AMP. LOADING to maintain the reading of TOTAL GRID CURRENT between 1.5 and 2.0 amp.		See steps 33 and 34, following.
34	Intermediate ANT. TUNING potentiometer R-656, intermediate POWER AMP. PLATE TUNING potentiometer R-654, and DRIVER PLATE TUNING potentiometer R-653	Carefully readjust exactly to resonance.		

Item No.	Item	Action or condition	Normal indications	Corrective measures
	TUNING (contd)			
35	R.F. EXCITATION control R-519	Adjust for total IPA grid current of 0.3 to 0.5 amp, indicated on intermediate P.A. TEST meter M-507.		
36	LOADING potentiometer R-1573 and intermediate POWER AMP. LOADING potentiometer R-655	Adjust for desired TOTAL PLATE CURRENT and TOTAL GRID CURRENT readings.	Refer to Typical Meter Readings, Paragraph 24.	
37	P.A. PLATE VOLTAGE control S-1622	Readjust for 5500 volts on P.A. PLATE VOLTAGE meter M-1601.		
38	All tuning controls	Repeat steps 33 through 36.	Refer to Typical Meter Readings, Paragraph 24.	
39	TEST KEY S-316, S-521, S-1503, and S-1620	Operate to center position.	All r-f tube currents drop to low values.	Detune 2nd MULTIPLIER PLATE TUNING potentiometer R-652 slightly. Refer to Chapter 5.
40	KEYING INPUT FOR MARK switch S-502 and TEST KEYS-316, S-521, S-1503 or S-1620	Operate KEYING INPUT FOR MARK to each of its positions, and depress a TEST KEY at each setting, and release.	Carrier is applied each time TEST KEY is depressed. Meter readings rise and drop quickly and return to the same values at each operation.	Refer to Chapter 5.
	STOPPING			
41	AUTO SHUTDOWN switch S-324	Operate to on position.	After 15 minutes, all plate voltages are automatically shut off. Main breakers K-401 and K-1701 open, H.V. PLATE lamps I-306, I-506, I-1507, and I-1606 go out, Hv Warning lamps I-401, I-402, I-1701, and I-1702 go out, L.V. PLATE lamp I-305 goes out, and all d-c and r-f meter readings drop to zero.	Refer to Chapter 5.

Item No.	Item	Action or condition	Normal indications	Corrective measures
	STOPPING (contd)			
42	FILAMENT - EMERGENCY SHUT DOWN switch S-307 or S-510	Operate to OFF position.	All transmitter tube filaments go out. FILAMENT lamps I-304, I-505, I-1505, and I-1604 go out. BIAS PLATE lamps I-501, I-1506, and I-1605 go out. After 5 minutes, blowers stop.	
43	All front panel circuit breakers	Operate to OFF position after blowers stop.	Meter lamps go out. POWER ON lamps I-901 go out. Channel indicator lamps go out.	

CHAPTER 4

THEORY

52. Block Diagram
(fig. 90)

In the block diagram of fig. 90, Radio Transmitting Set AN/FRT-22 is broken into three major divisions. At left, set off by a vertical dashed line, is the equipment designated rack-and-panel type. This includes two oscillators, a frequency-shift keyer, a power supply for one of the oscillators and the keyer, and an input-patching panel for the selection of the oscillator to be used. In addition, this part of the diagram contains a group of servo amplifiers which are part of the transmitter tuning system. The basic transmitter, which consists of a buffer amplifier, two frequency multipliers, a driver, an intermediate power amplifier, and a power amplifier, plus the d-c power supplies necessary to operate these stages, occupies the remainder of the diagram. Two sets of equipment, designated as external equipment, occupy the lower right-hand corner of the diagram. These include the high-voltage power transformers and their primary control equipment.

a. For the purpose of the discussion that follows, this equipment will be considered as a complete and self-sufficient 15-kw continuous-wave radiotelegraph transmitter, in which the output stage will be referred to as the intermediate power amplifier (IPA), followed by a high-power amplifier (PA) whose supplies and controls are interlocked with those of the lower-power stages. The 15-kw intermediate amplifier and associated equipment will be discussed first, and the power amplifier with its associated equipment and interlocking provisions second.

b. Power Supply Assembly PP-1088/FRT-26 and Radio Transmitter T-454/FRT-26 are the two main enclosures which constitute the 15-kw portion. R-F Amplifier AM-738/FRT-22 and Power Supply Assembly PP-1089/FRT-22 are the two main enclosures which make up the power amplifier section. These four units are installed side by side, in the listed order, from left to right, to become the main portion of the transmitter. The remaining four units are to be located near but external to the main transmitter enclosure.

c. Radio Transmitter T-454/FRT-26 contains, in addition to the basic 15-kw section, several alternate exciters and interconnecting facilities which will be discussed under the heading of Exciters and Associated Equipment. In the discussion that follows, the equipment will be considered under these four general headings;

(1) *Exciter system.* The exciter system is contained within Radio Transmitter T-454/FRT-26 and consists of the following circuits:

(a) *R-F Oscillator O-270/FRT-26.* A 10-channel crystal controlled unit.

(b) *R-F Oscillator O-91/FRT-5.* A variable-frequency unit employing automatic frequency stabilization.

(c) *Frequency Shift Keyer KY-45/FRT-5.* A stable, heterodyne type unit, which may be used in conjunction with either of the above oscillators.

(2) *Transmitter proper.* The transmitter proper consists of a buffer amplifier, a frequency multiplier, an electronic keyer, a driver, an intermediate power amplifier, and a coupling network, all of which are contained within Radio Transmitter T-454/FRT-26 R-F Amplifier AM-738/FRT-22 contains a power amplifier and an output network. Both units contain servo-tuning channel switching and special metering and monitoring systems.

(3) *Power Supplies.* The power supplies contained in Power Supply Assembly PP-1088/FRT-26 consist of a low-voltage power supply, a bias supply for the driver and intermediate power amplifier, and an intermediate power amplifier high-voltage supply. Power Supply Assembly PP-1089/FRT-22 contains a bias supply and a high-voltage supply for the power amplifier.

(4) *Power Control circuits.* All switches, relays, and most contactors required for the control and supervision of the 15-kw section are located in Power Supply Assembly PP-1088/FRT-26. Those additional switches, relays,

etc., required for control of the power amplifier are located in Power Supply Assembly PP-1089/FRT-22. These circuits are cross-connected and interlocked to insure the proper operating sequence. Start-stop contactors and circuit breakers for control of the primary power to the plate transformers are located in the external Power Supply Control C-1402/FRT-26 and Power Control C-598/FRT-6.

53. Exciters and Associated Equipment

Three separate sources of excitation are provided in this equipment: crystal oscillator frequency control by means of R-F Oscillator O-270/FRT-26, master oscillator frequency control by means of R-F Oscillator O-91/FRT-5, and frequency-shift keying by means of Frequency Shift Keyer KY-45/FRT-5 in conjunction with either r-f oscillator. A convenient means of selecting and interconnecting these exciters is provided by an input switching panel which consists of coaxial jacks with short coaxial jumper connectors which couple between these jacks. All of these units are contained within Radio Transmitter T-454/FRT-26. The theory of operation of these units is given in more detail in the following paragraphs.

a. R-F Oscillator O-270/FRT-26 (fig. 91). This is a 10-channel crystal oscillator capable of delivering 2 to 4 volts RMS into a 50- to 80-ohm load over the frequency range 2,000 to 4,300 kc. It utilizes a modified Colpitts oscillator circuit and has an untuned plate load in the crystal-controlled oscillator, followed by an untuned buffer. The oscillator is conventional in that it utilizes the cathode, grid, and screen of the tube as a triode. The crystal is connected from grid to ground, while the screen is at r-f ground potential. Therefore, the crystal operates as a parallel-resonant circuit between the grid and screen. Feedback is provided by the voltage-dividing action of C-1112 and C-1111. The input capacity of the oscillator tube is in parallel with C-1111. This is an extremely stable oscillator circuit, since the crystal itself is the only resonant element. Electron coupling provides the means of coupling to the plate of the oscillator. The buffer stage is operated as a cathode follower as the most effective means of operating into a low-impedance transmission line. The load impedance presented by the line is increased by autotransformer T-1102, so that the cathode follower will operate into a more desirable load.

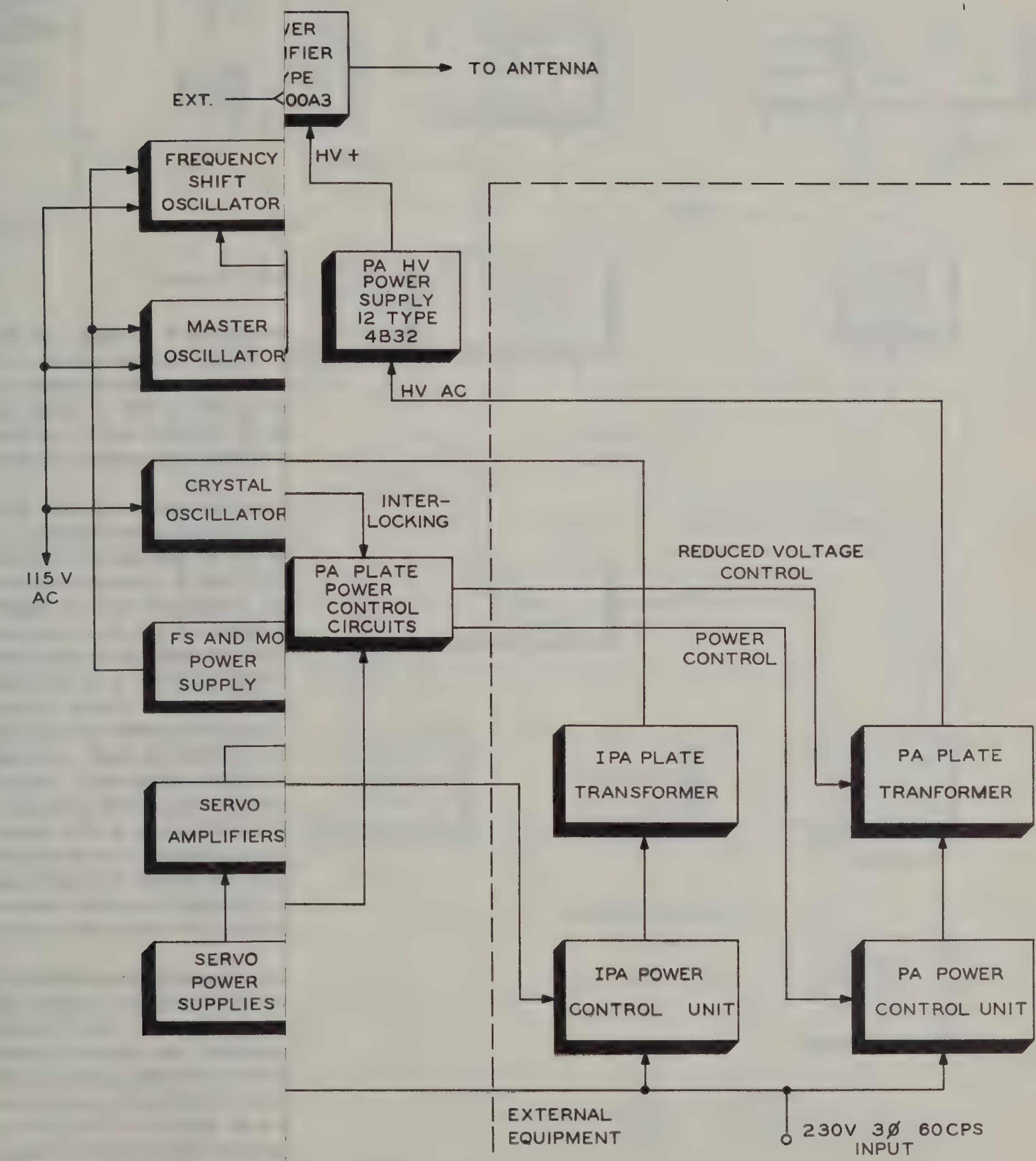
(1) Voltage regulator tubes V-1103 and V-1104 maintain the oscillator and buffer operating voltages at 180 volts. Capacitors C-1101 through C-1110 are shunts across the crystals to provide a means for exact frequency setting of the crystal oscillator. The 10 crystals, type AN/CR27-U, are mounted within a common temperature-controlled oven. Its temperature is controlled by a heater-and-thermostat arrangement which requires approximately 1 ampere at 12 volts when the thermostat is closed. The presence of heater voltage is indicated by a pilot lamp, I-1102, on the front panel, while proper functioning of the thermostat is indicated by intermittent operation of a second pilot lamp, I-1103, also on the front panel. The crystal selector switch is operated by an autopositioner; one of its wafers is an integral part of the plug-in crystal oven. This wafer is the one that actually selects the active crystal. By this means it is possible to provide a crystal oven with only one r-f output terminal even though it contains up to 10 crystals. Care must be exercised in inserting this crystal oven so that the switch wafer engages properly with its operating shaft.

(2) Power for this oscillator is derived from the low-voltage d-c power supply of the transmitter. The oscillator is equipped with a self-contained meter for checking the oscillator and buffer cathode currents. A selector switch provides the means for inserting this meter into the desired circuit. In addition is a provision for externally metering these two stages at output jack J-1102 and its associated plug, P-1102.

b. R-F Oscillator O-91/FRT-5. This is a very stable variable-frequency oscillator which covers a frequency range of 2 to 4.2 mc. It employs a master oscillator and amplifiers in conjunction with automatic frequency-control circuits which maintain the output frequency constant at any selected value within its range. The actual circuits that provide excitation to the transmitter are the master oscillator, V-131, multiplier V-112, and final amplifier V-114. The remainder of the circuits, with the exception of the 450-kc amplifier V-106 and the 100-kc amplifier V-107, are the frequency-control circuits. The 450-kc amplifier and the 100-kc amplifier are both provided with external jacks so that the output of either may be used on any external equipment as required. Fig. 92 is a block diagram of the oscillator.

(1) The stability of R-F Oscillator O-91/FRT-5 is derived from a 100-kc standard, either external or internal. This 100-kc signal is subdivided by a divider circuit to 25 kc and is then passed into a harmonic amplifier circuit whose output is in the range 9.125 to 21.625 mc.

(2) This 9.125 to 21.625 mc signal is mixed with the fifth harmonic of the output frequency (10 to 22.0 mc) to produce an intermediate frequency (i-f) in the range 875 to



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EXT.
HV +
FREQUENCY SHIFT OSCILLATOR
PA HV POWER SUPPLY 12 TYPE 4B32
MASTER OSCILLATOR
HV AC
CRYSTAL OSCILLATOR
INTER-LOCKING
REDUCED VOLTAGE CONTROL
115 V AC
PA PLATE POWER CONTROL CIRCUITS
FS AND MO POWER SUPPLY
POWER CONTROL
IPA PLATE TRANSFORMER
PA PLATE TRANFORMER
SERVO AMPLIFIERS
SERVO POWER SUPPLIES
IPA POWER CONTROL UNIT
PA POWER CONTROL UNIT
EXTERNAL EQUIPMENT
230V 3Ø 60CPS INPUT

etc., required for control of the power amplifier are located in Power Supply Assembly PP-1089/FRT-22. These circuits are cross-connected and interlocked to insure the proper operating sequence. Start-stop contactors and circuit breakers for control of the primary power to the plate transformers are located in the external Power Supply Control C-1402/FRT-26 and Power Control C-598/FRT-6.

53. Exciters and Associated Equipment

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(1) Voltage regulator tubes V-1103 and V-1104 maintain the oscillator and buffer operating voltages at 180 volts. Capacitors C-1101 through C-1110 are shunts across the crystals to provide a means for exact frequency setting of the crystal oscillator. The 10 crystals, type AN/CR27-U, are mounted within a common temperature-controlled oven. Its temperature is controlled by a heater-and-thermostat arrangement which requires approximately 1 ampere at 12 volts when the thermostat is closed. The presence of heater voltage is indicated by a pilot lamp, I-1102, on the front panel, while proper functioning of the thermostat is indicated by intermittent operation of a second pilot lamp, I-1103, also on the front panel. The crystal selector switch is operated by an autopositioner; one of its wafers is an integral part of the plug-in crystal oven. This wafer is the one that actually selects the active crystal. By this means it is possible to provide a crystal oven with only one r-f output terminal even though it contains up to 10 crystals. Care must be exercised in inserting this crystal oven so that the switch wafer engages properly with its operating shaft.

(2) Power for this oscillator is derived from the low-voltage d-c power supply of the transmitter. The oscillator is equipped with a self-contained meter for checking the oscillator and buffer cathode currents. A selector switch provides the means for inserting this meter into the desired circuit. In addition is a provision for externally metering these two stages at output jack J-1102 and its associated plug, P-1102.

b. R-F Oscillator O-91/FRT-5. This is a very stable variable-frequency oscillator which covers a frequency range of 2 to 4.2 mc. It employs a master oscillator and amplifiers in conjunction with automatic frequency-control circuits which maintain the output frequency constant at any selected value within its range. The actual circuits that provide excitation to the transmitter are the master oscillator, V-131, multiplier V-112, and final amplifier V-114. The remainder of the circuits, with the exception of the 450-kc amplifier V-106 and the 100-kc amplifier V-107, are the frequency-control circuits. The 450-kc amplifier and the 100-kc amplifier are both provided with external jacks so that the output of either may be used on any external equipment as required. Fig. 92 is a block diagram of the oscillator.

(1) The stability of R-F Oscillator O-91/FRT-5 is derived from a 100-kc standard, either external or internal. This 100-kc signal is subdivided by a divider circuit to 25 kc and is then passed into a harmonic amplifier circuit whose output is in the range 9.125 to 21.625 mc.

(2) This 9.125 to 21.625 mc signal is mixed with the fifth harmonic of the output frequency (10 to 22.0 mc) to produce an intermediate frequency (i-f) in the range 875 to

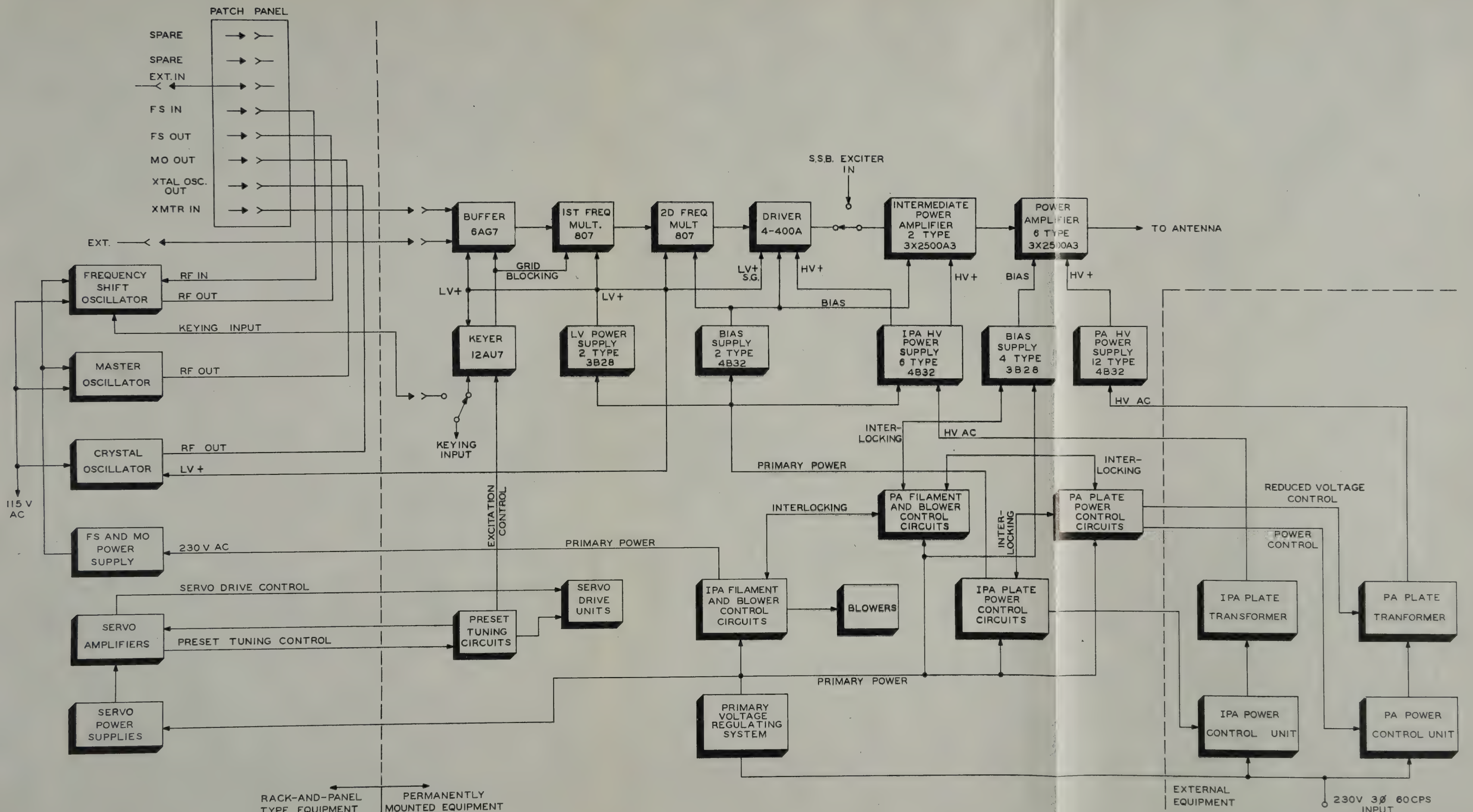


Figure 90. Radio Transmitting Set AN/FRT-22, Block Diagram.

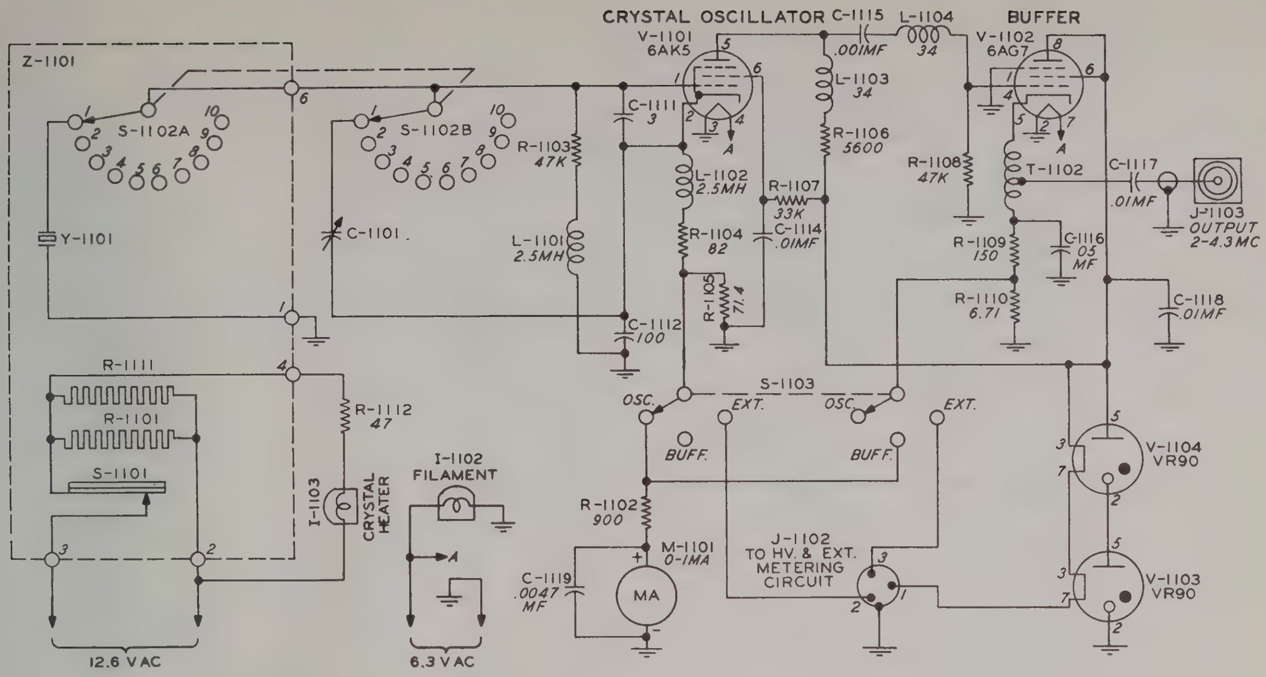


Figure 91. R-F Oscillator O-270/FRT-26, Simplified Schematic Diagram.

900 kc. This if is amplified and combined in a second mixer with a 75 to 100 kc signal which is obtained by subdividing the output from a 600 to 800 kc interpolation oscillator. The second if is then a narrow band of frequencies centered on 800 kc.

(3) This 800-kc signal is then divided to 100 kc in a regenerative divider circuit. Any error involved in setting up the master oscillator will also appear in this 100-kc signal. This signal is then combined, in a pair of diode mixers, with a signal from the 100-kc standard to produce an output which is audible and is a definite measure of the frequency error. In one of the diode mixers the 100-kc standard signal is shifted 90 degrees, thus providing a two-phase audio output. This audio output from the mixers is passed into a pair of d-c amplifiers and thence into a pair of power amplifiers. The resultant two-phase output from the power amplifiers is fed to the AFC motor, which rotates in such a manner as to adjust the master oscillator to the desired frequency.

(4) In the following discussion of circuit details, the exciter circuits and frequency-control circuits are discussed separately. While these circuits are interconnected, the excitation (magnitude) is not directly dependent upon the control circuits. In an attempt to clarify the explanation, the control circuits are explained by considering first one signal and following it to a mixer, returning and picking up the signal with which it is to be mixed, and then proceeding with the discussion from the output of the mixer. The individual circuit theory is as follows:

(a) *Master oscillator (fig. 93).* The oscillator assembly is a precision device which supplies an r-f output whose frequency is very stable under conditions of extreme temperature and humidity change. The circuit used is an electron-coupled type employing a 6SJ7 tube, V-131, and covering a frequency range of 1000 to 1500 kc. The output frequency of the oscillator is determined by the position of the tuning slug within the grid inductor, L-103, and the capacity setting of C-126, which is across the grid coil. The tuning slug position is determined by the setting of

the MASTER OSCILLATOR dial, $\boxed{\text{A1}}$.

The setting of C-126 is determined by the frequency control circuit which operates the AFC motor that is in turn mechanically linked to capacitor C-126.

(b) *Multiplier V-112 (fig. 94):* The multiplier stage, V-112, employs a type 6BE6 miniature pentagrid tube operating as a Class C stage with cathode bias. The input voltage is fed to number 1 grid of V-112 through R-242, which is used to reduce the input voltage slightly so that the mul-

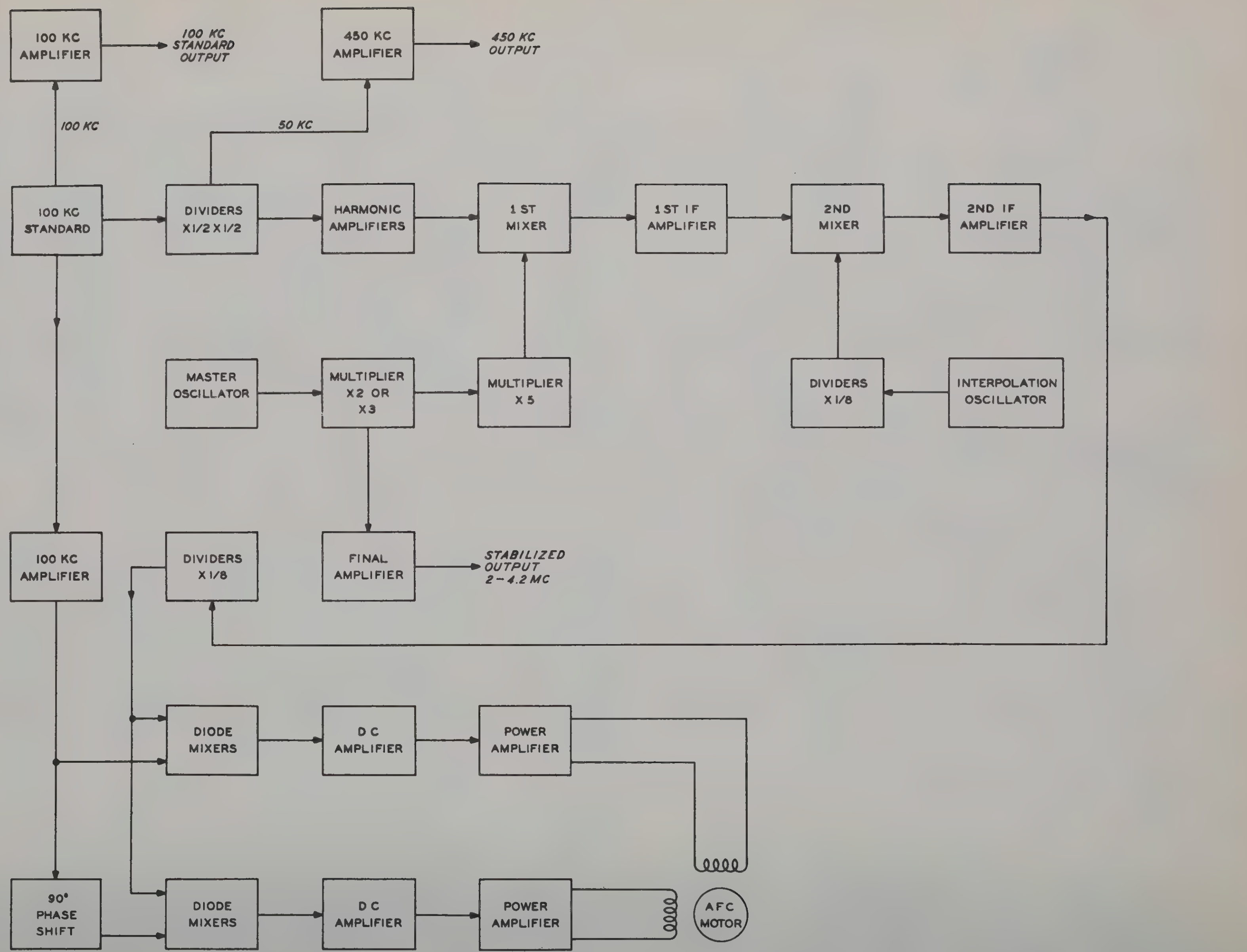


Figure 92. R-F Oscillator O-91/FRT-5, Block Diagram.

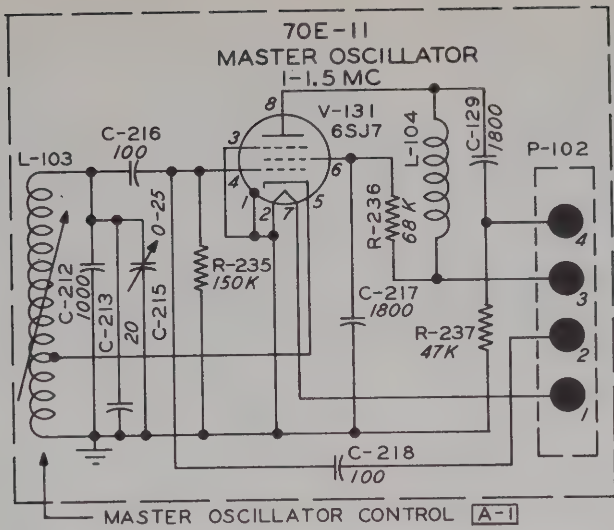


Figure 93. R-F Oscillator O-91/FRT-5, Master Oscillator Schematic Diagram.

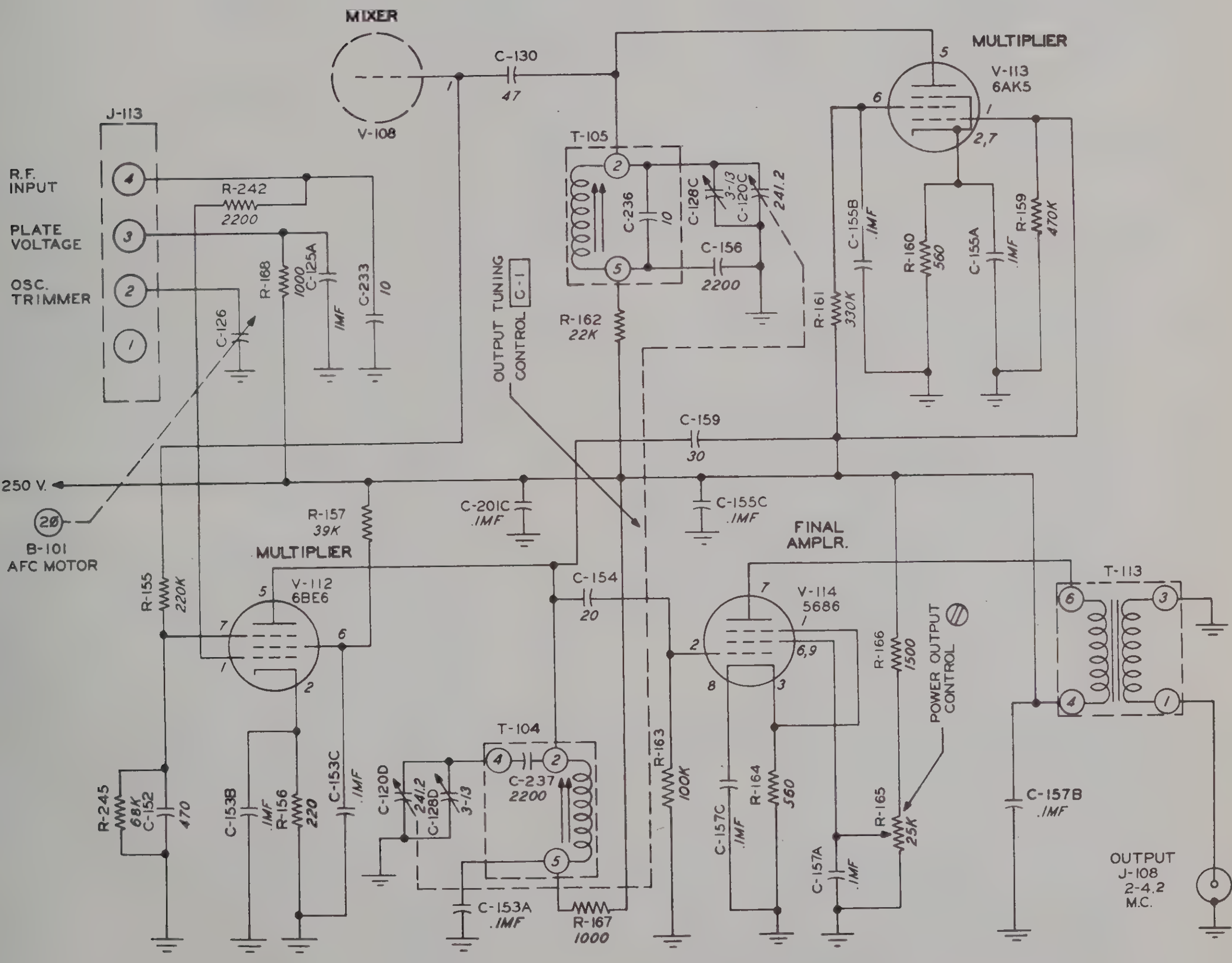


Figure 94. R-F Oscillator O-91/FRT-5, Multipliers and Final Amplifier, Schematic Diagram.

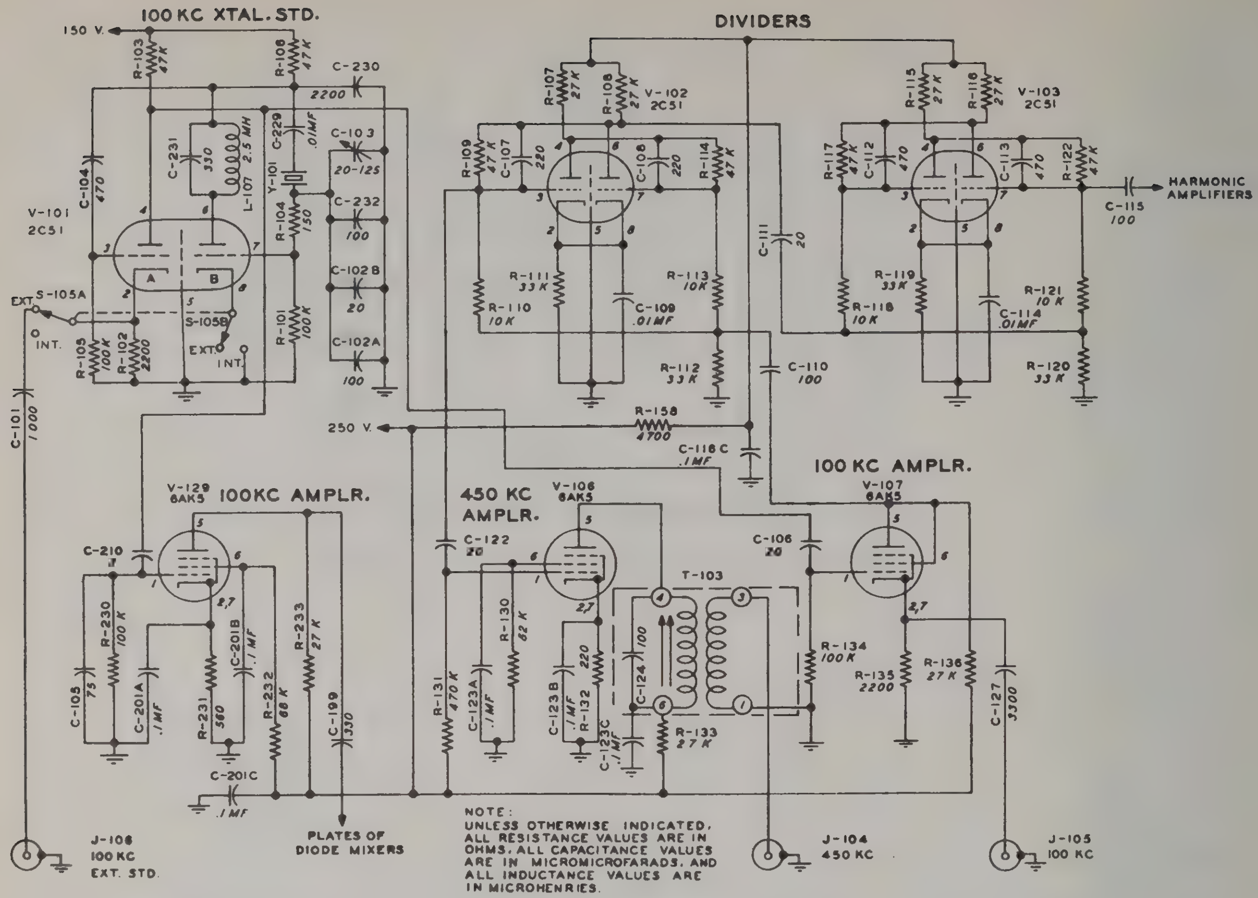


Figure 95. R-F Oscillator O-91/FRT-5, Crystal Oscillator, Dividers, and Amplifiers, Schematic Diagram.

tiplier stage will not be overdriven. In the plate circuit of V-112 is a tuned circuit composed of a slug-tuned inductor, T-104, a trimmer capacitor, C-128D, and one section of variable ganged capacitor C-120D. The tank circuit, T-104, is tuned to twice the input frequency to produce an output frequency from the final amplifier of 2 to 3 mc, or is tuned to three times the input frequency to produce an output frequency from the final amplifier of 3 to 4.2 mc. Tuning is accomplished by the OUTPUT TUNING dial

$\boxed{\text{C1}}$ (C-120D). The output of V-112 is

capacity coupled through C-159 to the second multiplier grid and through C-154 to the final amplifier grid.

(c) *Final amplifier (fig. 94).* The final amplifier is a class A stage operating as a straight amplifier. Input voltage is fed from the plate circuit of V-112 through capacitor C-154 to the control grid of V-114. A voltage divider arrangement using a potentiometer, whose arm is connected to the screen of V-114, provides a means of varying the screen voltage, which in turn varies the power output of the final amplifier stage. The plate circuit of V-114 contains an untuned transformer, T-113, whose output winding is coupled to the output jack J-108.

(d) *100-kc crystal oscillator and amplifier (fig. 95).* The 100-kc oscillator-and-amplifier circuit employs a twin triode tube, type 2C51 (V-101A and V-101B). This circuit is designed so that either the 100-kc crystal supplied with the oscillator or an external 100-kc crystal can be used as a standard. When an external crystal oscillator is used, its output is connected to the cathode of amplifier V-101A through J-102 and capacitor C-101. The switch S-105 must be turned to the EXT. position. This opens the cathode of V-101B, disabling the circuit. V-101A continues to operate as an amplifier, supplying a 100-kc signal to the 100-kc amplifiers V-107 and V-129. When the internal

100-kc oscillator is to be used, the switch S-105 is turned to INT. position, which closes the cathode circuit of section B of V-101. Capacitors C-102A and C-102B, C-232, and C-103, in parallel, are connected in series with the 100-kc crystal. C-103 adjusts the frequency to exactly 100 kc. The 100-kc crystal, Y-101, is contained in a temperature-controlled oven. When the 115 volts a-c is applied to the crystal oven, pilot lamp I-101, designated XTAL HEAT, lights to indicate that the heater is energized to raise the temperature of the oven. The temperature is thermostatically controlled between 59° and 61° C (138.2° to 141.8°F). When the temperature within the oven becomes stabilized, the heating cycle should be "heat on" about four or five minutes and "heat off" eight to ten minutes (at normal room temperature). The required stability is reached within one hour after a-c power is applied. Capacitor C-205 is connected across the thermostat contacts to prevent arcing. The output of the crystal oscillator section is fed to the grid of section A of V-101 through capacitor C-104. Section A of V-101 is operated as a class A amplifier. The output of this amplifier is fed to the grids of the 100-kc amplifiers, V-107 and V-129.

(e) *100-kc amplifier (V-107) (fig. 95).* The 100-kc amplifier, V-107, employs a type 6AK5 tube, triode-connected. It is operated class A. Output of V-107 is coupled to the grids of the first crystal divider, V-102, through coupling capacitor C-110. A second connection is made, through coupling capacitor C-127 to J-105, a coaxial connector mounted at the rear of the chassis, permitting the 100-kc signal to be used externally as required.

(f) *Crystal dividers (fig. 95).* The crystal dividers are multivibrator, or "flip-flop" circuits. The purpose of this circuit is to divide the input frequency by four. The 50-kc divider V-102 will first be considered. The normal condition of the divider when no excitation voltage is being applied to the grids is that one section of the tube (say section A) is drawing plate current, and at the same time the plate current in section B is zero. When a negative voltage is applied to the grids of both sections, the plate current in section A will be decreased. This causes a decreased voltage drop across R-107, which in turn makes the voltage on the grid of section B more positive. Consequently, plate current flows in section B, increasing the voltage drop across R-108. This makes the grid of section A more negative, causing a further decrease in its plate current and as a result, further increase in plate current of section B. The process continues until section A is cut off, and only section B draws plate current. This condition will continue until the next negative pulse is applied to the grids, at which time the action will reverse. The function of divider circuit V-103 is the same as V-102, with the exception that its output has a 25-kc fundamental. This signal is fed to the grid of the first harmonic amplifier.

(g) *Harmonic amplifiers (fig. 96).* The harmonic amplifiers employ a type 6AK5 tube (V-104) for the first harmonic amplifier and a type 6AS6 (V-105) tube for the second harmonic amplifier. The plate circuit of V-104 is tuned by C-120B, C-128B, and a slug-tuned inductor, T-101. Capacitor C-119 isolates dc from C-120B and C-128B of the tuned circuit to make possible the grounding of the rotor of C-120B. The capacity of C-119 is sufficiently large that its effect on the tuned circuit is negligible. Capacitor C-120B is controlled by the OUTPUT TUNING dial $\boxed{C1}$ on the front panel. The plate circuit of V-104 is coupled to the grid of V-105 through coupling capacitor C-117. Harmonic amplifier V-105 contains a tuned circuit similar to V-104, with its tuning capacitor C-120A also controlled by the OUTPUT TUNING dial $\boxed{C1}$. The tuned circuits of both V-104 and V-105 are designed to cover a frequency range of 9.125 to 21.625 mc. The plate of V-104 and the plate and screen of V-105 are supplied with +150 volts regulated. The harmonic amplifier output is coupled to mixer V-108 through capacitor C-129. The other signal voltage is fed to this mixer from multiplier V-113.

(h) *Multiplier V-113 (fig. 96).* The multiplier V-113 receives its input voltage from the plate of multiplier V-112 through coupling capacitor C-159. It operates as a Class C amplifier and multiplies the input frequency 5 times. The tuned circuit of V-113 consists of main tuning capacitor C-120C, which is controlled by the OUTPUT TUNING dial $\boxed{C1}$, trimmer capa-

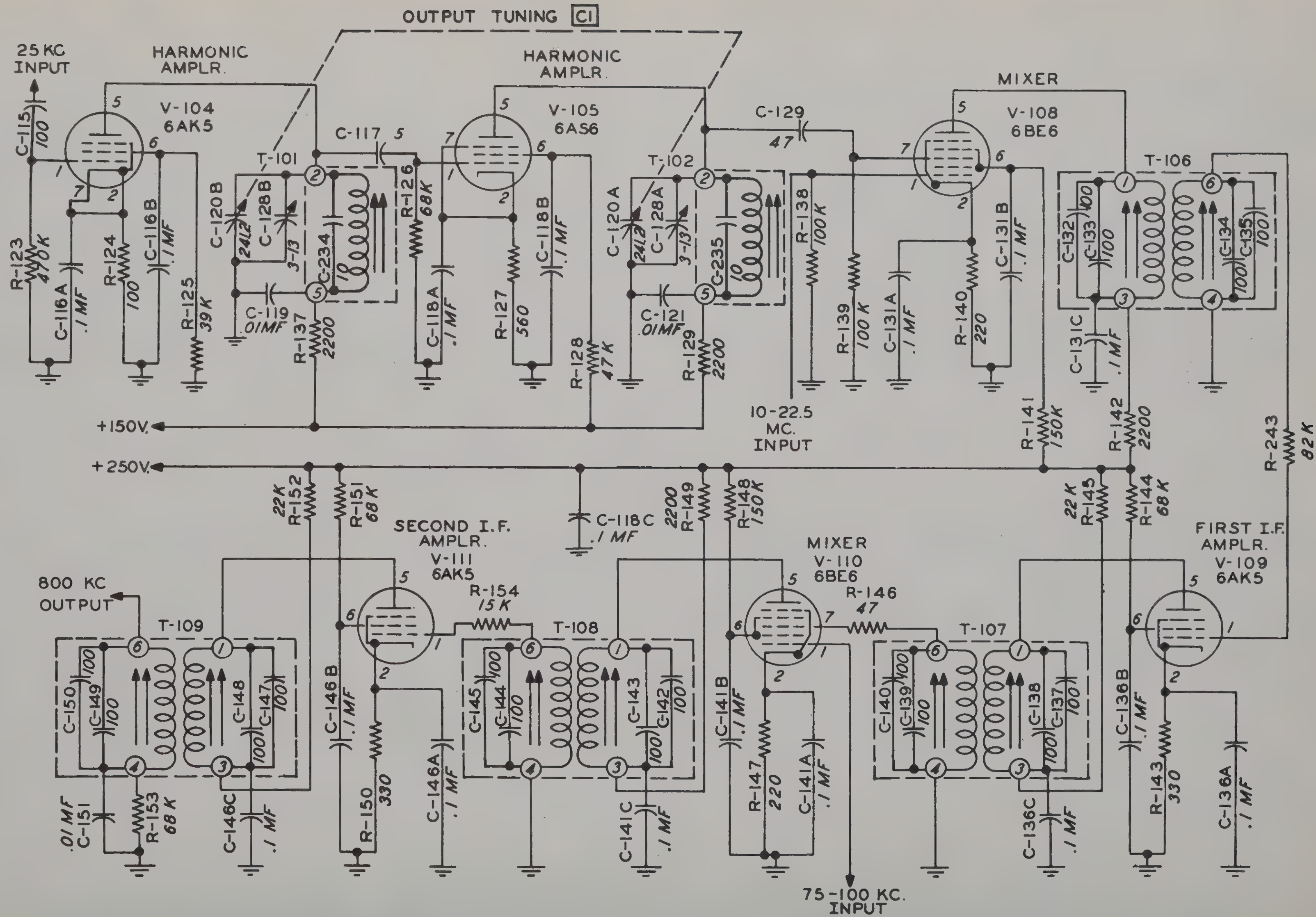


Figure 96. ***R-F Oscillator O-91/FRT-5, Harmonic Amplifiers, I-F Amplifiers, and Mixers, Schematic Diagram.***

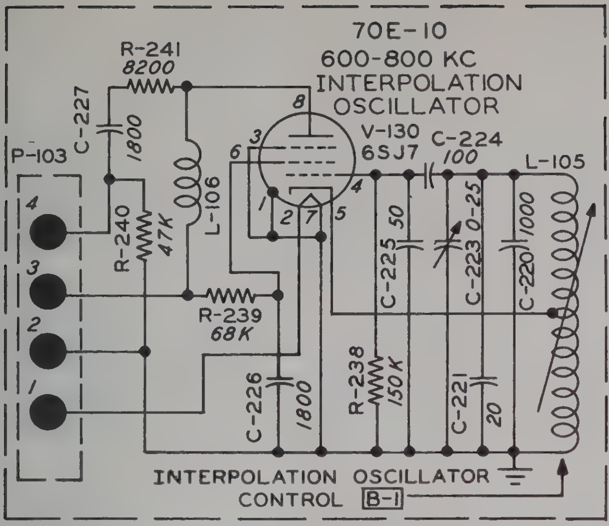


Figure 97. R-F Oscillator O-91/FRT-5, Interpolation Oscillator, Schematic Diagram.

citor C-128C, and a slug-tuned inductor, T-105. Capacitor C-156 isolates C-120C and C-128C for dc.

(i) *First I-F (875 to 900 kc) (fig. 96).*

1. *Mixer.* The mixer stage employs a type 6BE6 (V-108) pentagrid converter. The output frequency of harmonic amplifier V-105 is fed to grid number 3 of V-108 and the output frequency of multiplier V-113 is fed to grid number 1 of V-108. These two injected signals are mixed, and the plate tuned circuit is tuned to the difference frequency. Coupling V-108 to the grid of V-109 is a double-tuned i-f transformer, T-106. Overcoupling flattens out the peak of the i-f response enough to pass the required frequencies, 875 to 900 kc.

2. *Amplifier (fig. 96).* The i-f amplifier operates as a class A stage and employs a type 6AK5 (V-109) pentode. I-f transformer T-107 is connected to the plate of V-109 and the grid of V-110. This transformer, like T-106, is required to pass 875 to 900 kc, and is overcoupled to flatten out the peak.

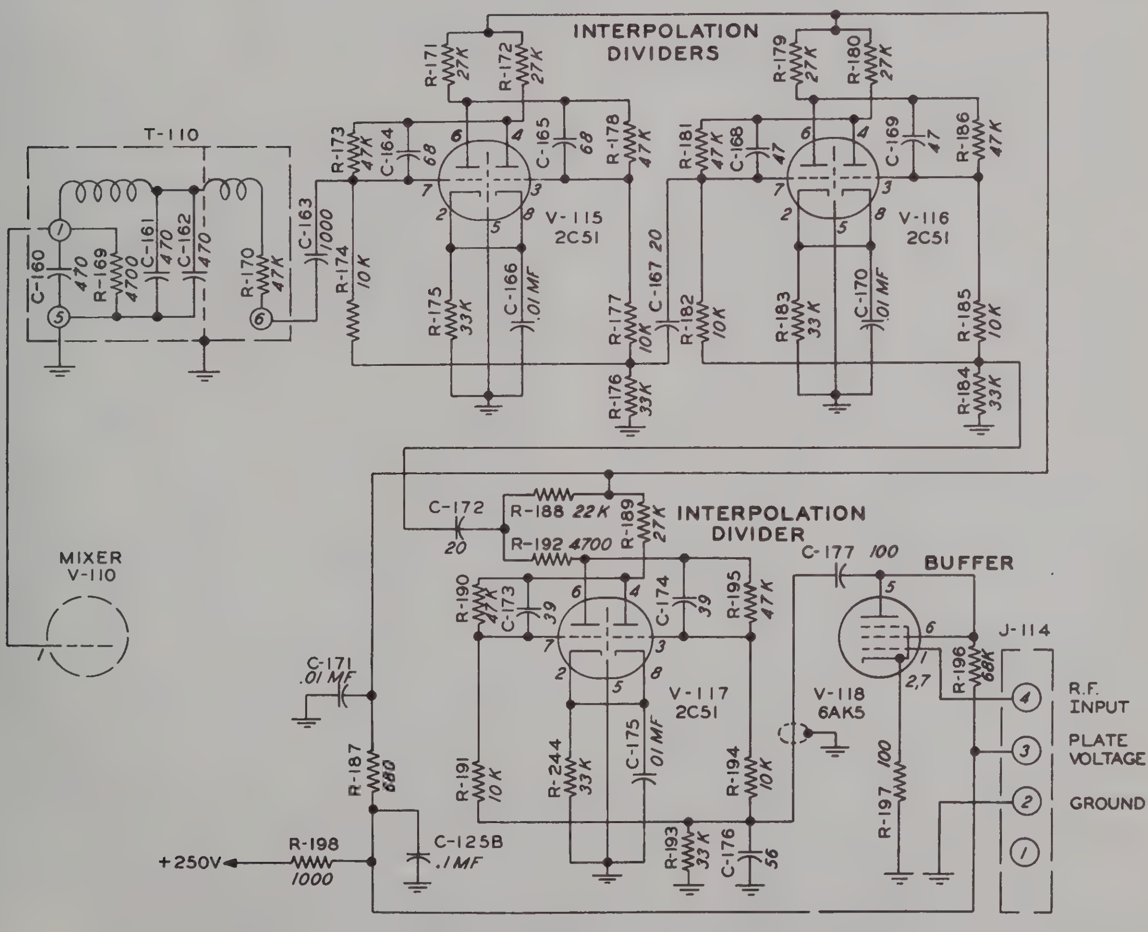


Figure 98. R-F Oscillator O-91/FRT-5, Buffer and Interpolation Dividers, Schematic Diagram.

(j) *Interpolation circuits.* At the mixer in the second i-f strip, one of the mixing voltages is supplied by the first i-f strip; the other voltage is supplied by an interpolation circuit consisting of an interpolation oscillator, a buffer and three interpolation dividers.

1. *Interpolation oscillator (fig. 97).* The interpolation oscillator assembly is a precision device which supplies an output frequency that is extremely stable under widely varying conditions of temperature and humidity. The circuit used is electron-coupled, employing a 6SJ7 tube, V-130, and covering a frequency range of 600 to 800 kc. The output frequency of the oscillator is determined by the position of the tuning slug within the grid inductor L-105 with fixed capacity across the coil. The tuning slug position is determined by the setting of the INTERPOLATION OSCILLATOR dial $\boxed{\text{B1}}$. The plate circuit of the interpolation oscillator is untuned. The output of the oscillator is fed to the grid of buffer V-118 through coupling capacitor C-227.

2. *Buffer.* The buffer operates as a class A amplifier employing a type 6AK5 (V-118) triode-connected. The output of V-118 is capacity coupled to the grids of the first divider circuit V-117 through capacitor C-177.

3. *Interpolation dividers (fig. 98).* The interpolation dividers operate in the same way

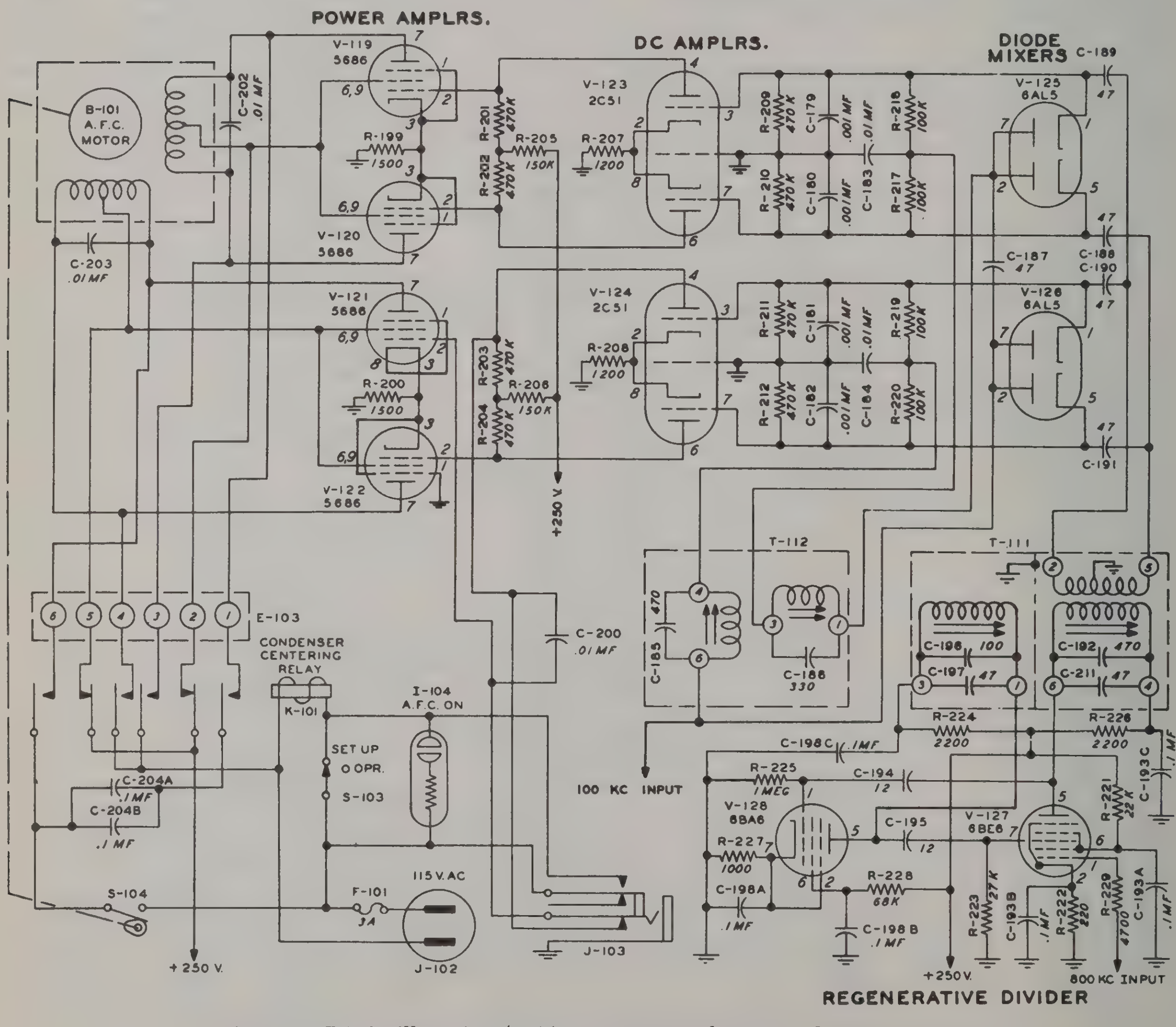


Figure 99. R-F Oscillator O-91/FRT-5, Motor Control Circuit, Schematic Diagram.

as the crystal dividers. Refer to the paragraph describing crystal dividers for the theory of operation.

a. *Interpolation divider (300 to 400 kc).* The first interpolation divider, V-117, has an input frequency of from 600 to 800 kc, depending on where the INTERPOLATION OSCILLATOR dial is set. The output frequency of V-117 is one-half of the input frequency, or 300 to 400 kc.

b. *Interpolation divider (150-200 kc).* The second interpolation divider, V-118, has an input of from 300 to 400 kc. The output frequency of V-118 is one-half the input frequency, or 150 to 200 kc.

c. *Interpolation divider (75-100 kc).* The third interpolation divider, V-119, has an input frequency of from 150 to 200 kc. The output frequency of V-119 is one-half the input frequency, or 75 to 100 kc. The output frequency of interpolation divider V-119 is fed to the number 1 grid of mixer V-110 through coupling capacitor C-163 and lowpass filter T-110.

(k) *Second I-F (800 kc) (fig. 96).*

1. *Mixer.* The mixer stage employs a 6BE6 pentagrid converter (V-110). The output frequency of i-f amplifier V-109 is fed to grid number 3 of V-110, and the output of interpolation divider V-115 is fed to number 1 grid of V-110. These two injected signals are mixed, and the plate circuit is tuned to the difference frequency. I-f transformer T-108 couples the plate of V-110 to the grid of V-111, and is sharply tuned to pass only a narrow band of frequencies centered on 800 kc.

2. *Amplifier.* The i-f amplifier operates as a class A stage and employs a type 6AK5 pentode (V-109). The input voltage for V-109 is supplied by the i-f transformer T-108. I-f transformer T-109 connects the plate of V-111 to the grid of V-127, and is sharply tuned to pass a narrow band of frequencies centered on 800 kc.

(l) *Regenerative dividers (fig. 99).* The 800 kc output from T-109 is fed to number 1 grid of V-127, a mixer stage employing a type 6BE6 tube. A second voltage is applied to number 3 grid of V-127 from the plate of V-128. V-128 is a type 6BA6 tube in a regenerative amplifier circuit resonated at 700 kc. In mixer tube V-127, the 800-kc signal from second i-f amplifier V-111 and the 700-kc signal from regenerative amplifier V-128 are mixed. The tuned circuit in the plate of mixer V-127 is resonated to the difference frequency, or 100 kc. A second coil is inductively coupled to the tuned coil in the plate circuit of V-127 and its output is fed to the cathodes of the diode mixers V-125 and V-126. The tuned circuits of V-127 and V-128 are shielded from one another but are in a common container, and are designated T-111.

(m) *100-kc amplifier (V-129).* The 100-kc amplifier employs a type 6AK5 tube, V-129, operated as a class A amplifier. The 100-kc output voltage from its plate is fed to the plates of V-125 and V-126.

(n) *Diode mixers and power amplifiers (fig. 99).* The 100-kc output of buffer V-129 is coupled to the plates of diode mixer V-126 and, through phase-shifting transformer T-112, to the plates of diode mixer V-125, series fed to both diode circuits. T-112 introduces a 90-degree phase shift between the 100-kc standard inputs of the two mixers. The output of regenerative divider, nominally 100 kc, is shunt-fed to the two diode mixers, V-125 and V-126, in parallel. Low-pass filter networks attenuate all but the difference-frequency outputs, which are fed to push-pull, direct-coupled amplifiers V-123 and V-124. These are 2C51 twin triodes. The plates of V-123 are directly connected to the grids of push-pull power amplifiers V-119 and V-120, and V-124 feeds power amplifiers V-121 and V-122 in the same manner. The plate loads of these two push-pull power amplifiers consist of the two phase windings of afc motor B-101. The torque output of this motor is directly proportional to the frequency applied to it; its direction of rotation is a function of the relative phase of the voltages applied to its two windings. The magnitude of the phase difference between the two output voltages is fixed at 90 degrees by the 90-degree relationship of the two standard-frequency mixer inputs; however, the phase sequence of the two voltages is a function of the sign of the difference between the error signal frequency and the standard frequency. If the error frequency is lower than the standard, the phase sequence is the reverse of that which obtains when the error frequency is higher than the standard.

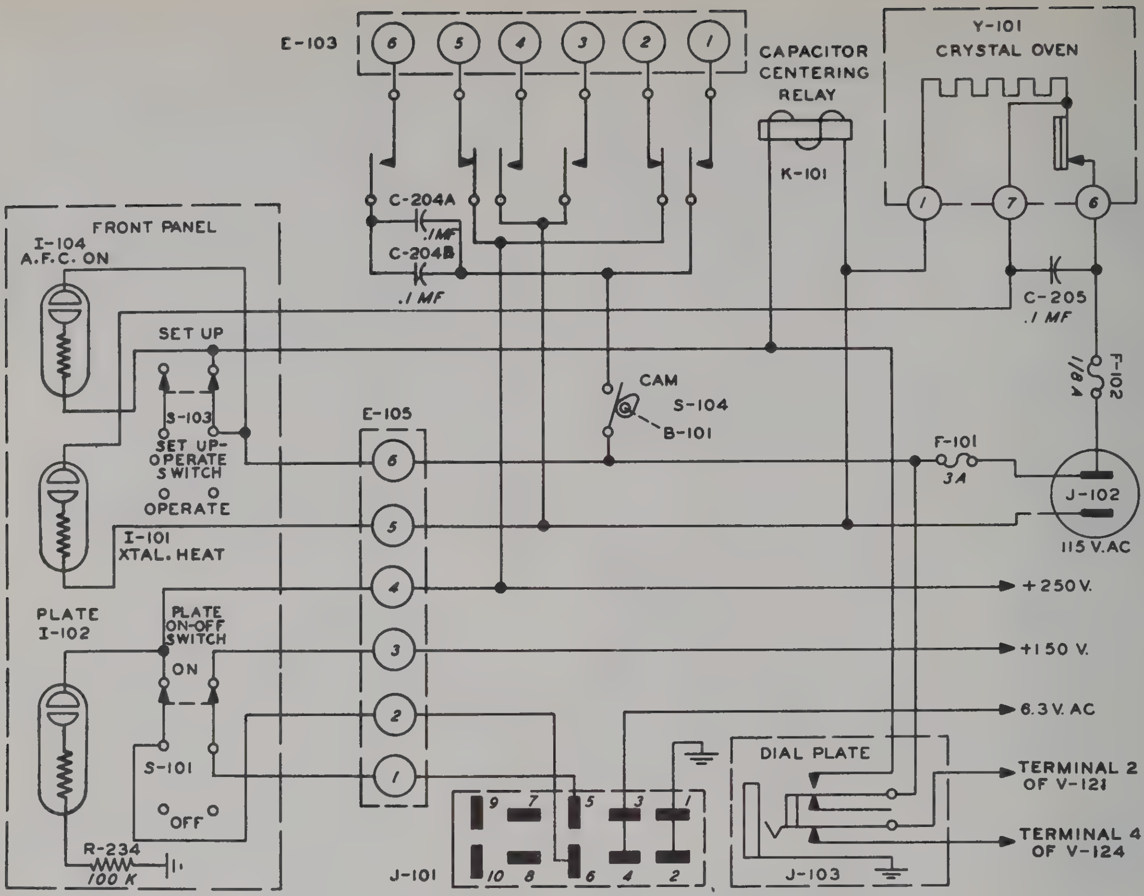


Figure 100. R-F Oscillator O-91/FRT-5, Power Control Circuit, Schematic Diagram.

(o) *450-kc amplifier (fig. 95).* The 450-kc amplifier employs a 6AK5 tube, V-106, operated class A. Its 50-kc input is furnished by the first crystal divider, V-102. A single-tuned output transformer, T-103, tunes the plate circuit to the ninth harmonic of 50 kilocycles, 450 kc. The secondary of this transformer is terminated in the 450-kc output jack, J-104.

(p) *Power control circuits (fig. 100).* Turning the SETUP-OPERATE switch to the SETUP position, or inserting a plug in the headphone jack, J-103, energizes capacitor centering relay K-101. The operation of this relay disables the automatic frequency control functions by removing plate voltage from the power amplifiers, V-119 through V-122, and extinguishes the AFC ON lamp I-104. In addition. contacts of K-101 cause 115-volt 60-cycle power to be applied to the motor B-101 through cam-actuated switch S-104. The afc motor runs until the capacitor, C-126, is centered in its range, at which time a cam opens S-104 and stops the rotation. Returning the unit to normal operating condition (by removing headphone plug or turning S-103 to OPERATE position) sets the afc circuits in operation to correct any error in the master oscillator frequency, and lights the AFC ON lamp.

(q) *Typical frequencies during operation (figs. 101 and 102).* To supplement the foregoing description, an illustrative example is here presented in which the oscillator has been set up on an output frequency of 3,127,362 cps.

1. In figure 101 it is assumed that the master oscillator is tuned to exactly the desired frequency; that is, there is no error in the setting of the master oscillator. Arrows indicate the direction of flow, and figures show the frequencies which will appear at each point in the circuit. Three frequencies are shown at the output of the harmonic amplifiers. Although a wide spectrum of frequencies, spaced 25 kc apart, is generated in this stage, only the fre-

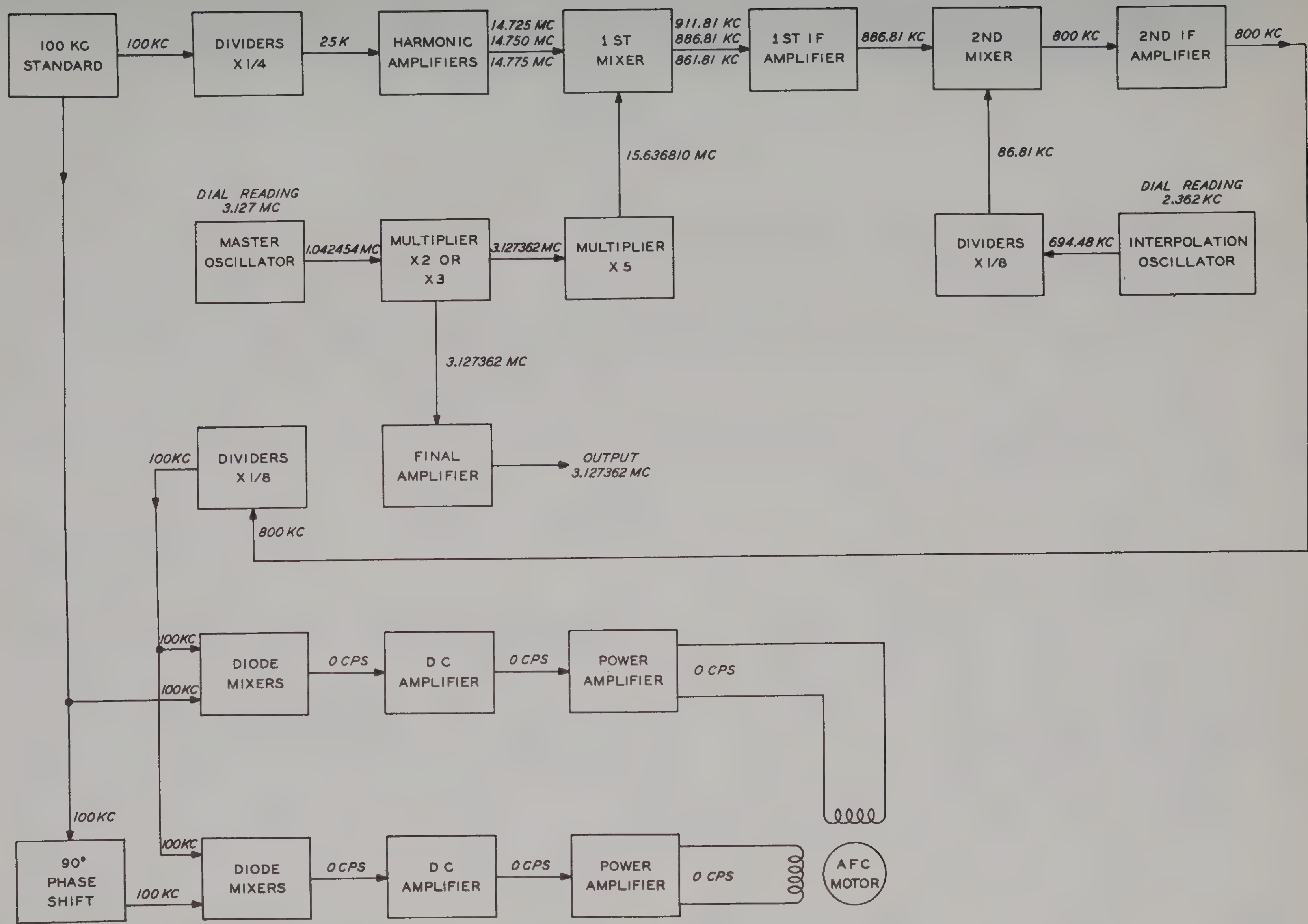


Figure 101. R-F Oscillator O-91/FRT-5, Typical Frequencies, No Error in Master Oscillator Setting, Block Diagram.

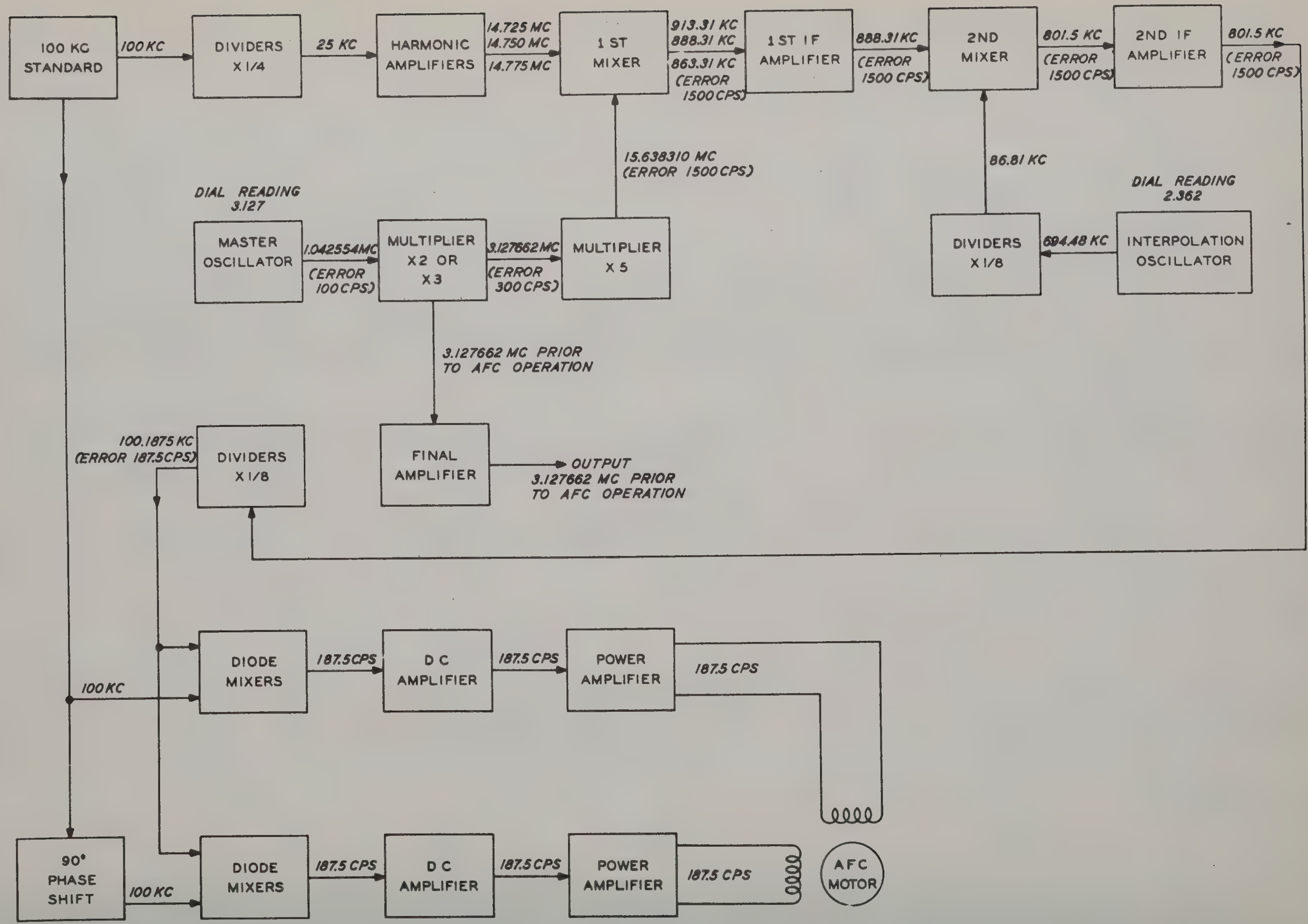


Figure 102. R-F Oscillator O-91/FRT-5, Typical Frequencies, 100-cycle Error in Master Oscillator Setting, Block Diagram.

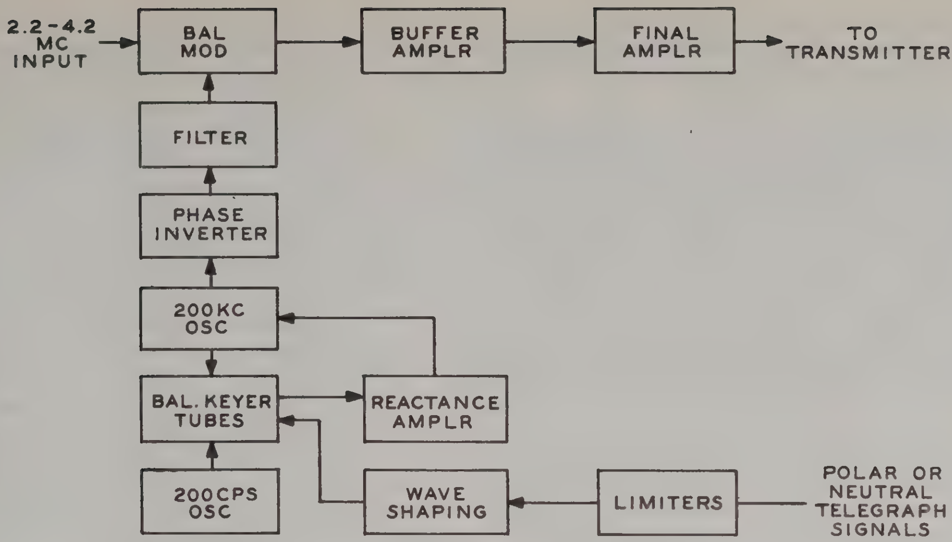


Figure 103. Frequency-Shift Keyer KY-45/FRT-5, Block Diagram.

quencies pertinent to this example and its two adjacent frequencies are shown here. The same applies to the frequencies shown at the output of the first mixer. In the first i-f amplifier strip, all the signals but one are sufficiently attenuated that they may be neglected, and only the 886.81-kc signal may be said to enter the second mixer. One situation might be encountered which could lead to confusion; consider the case in which the output frequency is such that the first i-f amplifier receives a frequency of 875 kilocycles and also one of 900 kc. Since both frequencies lie within the passband of this amplifier, both will be delivered to the second mixer in the same amplitude. However, the passband of the second i-f amplifier is very narrow, and only the one frequency which combines with the output of the interpolation dividers to produce an 800-kc signal will be used, the other being attenuated in the second i-f amplifier.

2. Some difficulty may be encountered in the difference between the INTERPOLATION OSCILLATOR dial reading and the actual frequency of the oscillator. The dial is marked 0 to 5000 cycles, while the tuning range of the oscillator is 600 to 800 kc. Thus with a reading of 0 on the dial, the oscillator is tuned to 600 kc, and 5000 on the dial corresponds to an oscillator frequency of 800 kc. A simple proportion may be written to indicate the oscillator frequency for any given dial setting. In this example, the dial reading is 2.362. The oscillator frequency, in kilocycles, is expressed as follows:

$$f_{osc} = 600 + \frac{200f\ dial}{5} =$$

$$600 + \frac{200 \times 2.362}{5} = 694.48\ kc$$

3. Figure 102 shows the frequencies which would result if the same output frequency of 3,127,362 cps were to be set up, but the MASTER OSCILLATOR dial setting were in error by 100 cycles. Any error in master oscillator frequency will produce a signal proportional in frequency to that error across the afc motor windings, and operate the motor to correct the master oscillator tuning. As the error frequency decreases, that is, the output frequency of the oscillator unit approaches the desired frequency, the torque output of the afc motor falls off until it reaches zero, and the master oscillator frequency has been corrected. It might be noted that the accuracy of frequency of the O-91/FTR-5 unit as a whole is a direct function of the accuracy with which the INTERPOLATION OSCILLATOR dial is set; therefore, that dial should be adjusted with care.

c. Frequency-Shift Keyer KY-45/FRT-5. The frequency-shift keyer is ordinarily used at the transmitting station of a frequency-shift radiotelegraph circuit. Telegraph signals are generated at a control point equipped with teleprinter keyboards and tape recorder. Both the transmitting and receiving radio stations may be remote from the communication

centers and are ordinarily connected to the station by means of land line. Figure 103 is a block diagram of the frequency-shift keyer.

(1) *Operating frequency.* The keyer requires an injection voltage in the range 2.2 to 4.2 megacycles, 200 kc higher than the operating range. This injection voltage is mixed with a internal 200-kc source of frequency-shifted voltage to produce output in the range 2 to 4 megacycles. The external injection voltage ordinarily is provided by R-F Oscillator O-91/FRT-5, but any stable injection voltage of good wave form in the range 2.2 to 4.2 mc may be used.

(2) *Balanced modulator, buffer and final amplifier.* A simplified schematic of the high-frequency portions of the frequency-shift keyer is shown in figure 104. A radio-frequency source in the range 2.2 to 4.2 megacycles is fed into J-1401 and then to the No. 1 grid of V-1401 and V-1402, which constitute the balanced modulator (fig. 105). The No. 3 grids of V-1401 and V-1402 are excited in push-pull from a 200-kc voltage derived from the frequency-shifted oscillator. Since the high-frequency input is supplied to the No. 1 grids of these tubes in parallel, this voltage is cancelled in the output circuit because of its push-pull arrangement. Complete cancellation of this voltage occurs when the balance potentiometer R-1416 is adjusted so that the transconductance of the two tubes is identical. With the high-frequency input cancelled, only the mixer products remain, the most important of which are the sum and difference frequencies produced by mixing the high-frequency signals with the 200-kc frequency-shift voltage. This keyer operates on the difference frequency (200 kc lower than the injected signal), which is selected by the four gang-tuned circuits associated with the OUTPUT TUNING control. These gang-tuned circuits include the modulator plate circuit (L-1402) and the buffer grid (L-1406), the power amplifier grid (L-1407), and the power amplifier plate circuit (L-1411). These four circuits are provided with inductive and capacitive trimming to make possible exact tracking throughout the 2 to 4 mc operating range. Because the tubes used in the buffer-amplifier and the final amplifier are tetrodes, neutralization is unnecessary. A meter switch, S-1402,

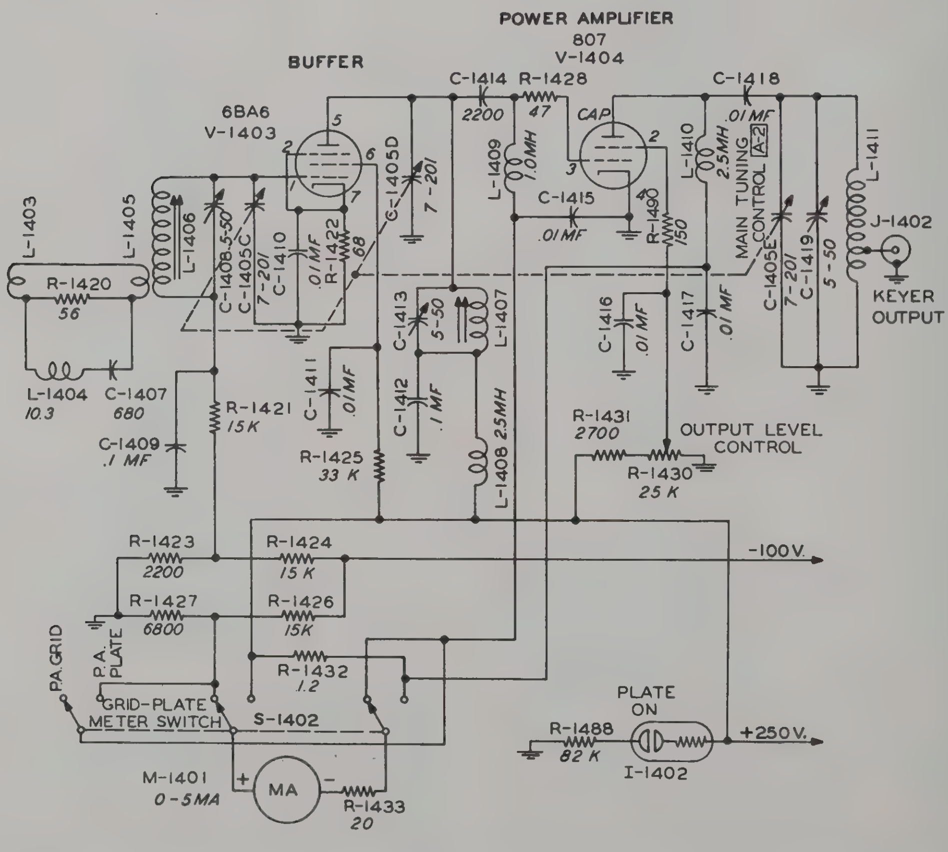


Figure 104. Frequency-Shift Keyer KY-45/FRT-5, Buffer and Power Amplifier, Schematic Diagram.

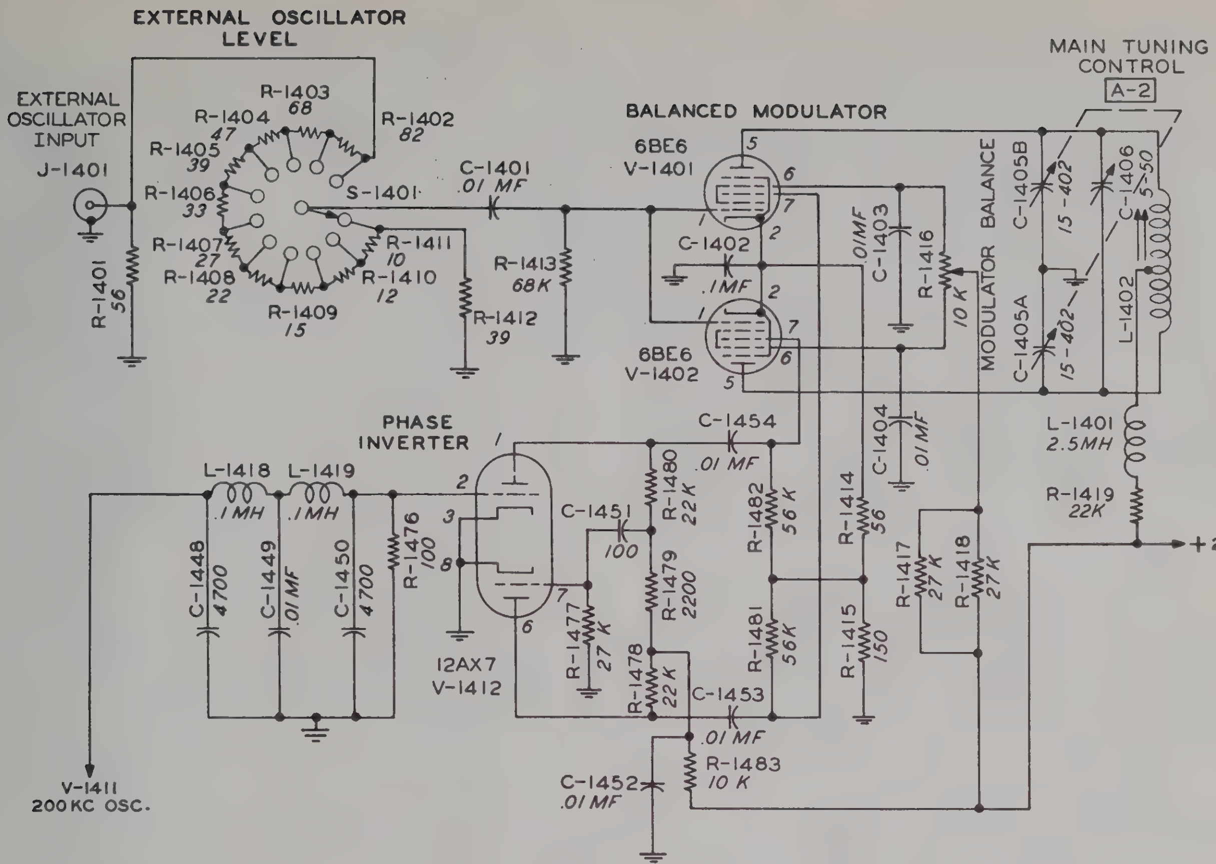


Figure 105. Frequency-Shift Keyer KY-45/FRT-5, Balanced Modulator and Phase Inverter, Schematic Diagram.

provides a means of measuring either grid or plate current of the final amplifier.

(3) *200-kc oscillator, balanced keyer, and reactance amplifiers (fig. 106).*

(a) The portion of the frequency-shift keyer which produces the frequency-shifted signal is a 200-kc oscillator, a balanced keyer tube, and phase-shifting amplifiers V-1411, V-1408, V-1409, and V-1410, respectively. The operation of the circuit can be most easily explained by means of vector diagrams which will be used in the course of this explanation (refer to fig. 107). If the vector E_0 represents the voltage across the oscillator grid coil, V-1408G_1 is the voltage at one terminal of the pick-up loop, L-1416, while V-1408G_2 is the voltage at the opposite terminal of the pick-up loop. The two voltages, V-1408G_1 and V-1408G_2 are fed to the grids of V-1408. Each section of the keyer tube is a voltage amplifier. Section I operates at a fixed amplification, and the other section operates under the control of keying impulses, and has a gain determined by the bias applied to its grid. If the constant bias voltage is applied to section 1 of V-1408, the output of this tube may be represented by the vector V-1408P_1. At some particular instant during keying the grid of section 2 may be more positive, and the plate signal may be represented by a vector 180° out of phase, vector V-1408P_2. The resultant vector at the plate of the tubes is shown at C. Because C-1435 has a high capacitive reactance at 200 kc, a leading current flows through the series circuit consisting of C-1435 and R-1463. Values of C-1435 and R-1463 in this circuit are so selected that about 70° of phase shift occurs, and the leading vector shown in D results across R-1463. The magnitude of this voltage may be adjusted by changing the position of the arm of potentiometer R-1458 and by the operation of the tap switch S-1405. This voltage is applied to the grid of V-1409. The output of this tube may be represented by the vector V-1409P, which is displaced 180° from the voltage on the grid of V-1409. Another capacitor-resistor series circuit, C-1437

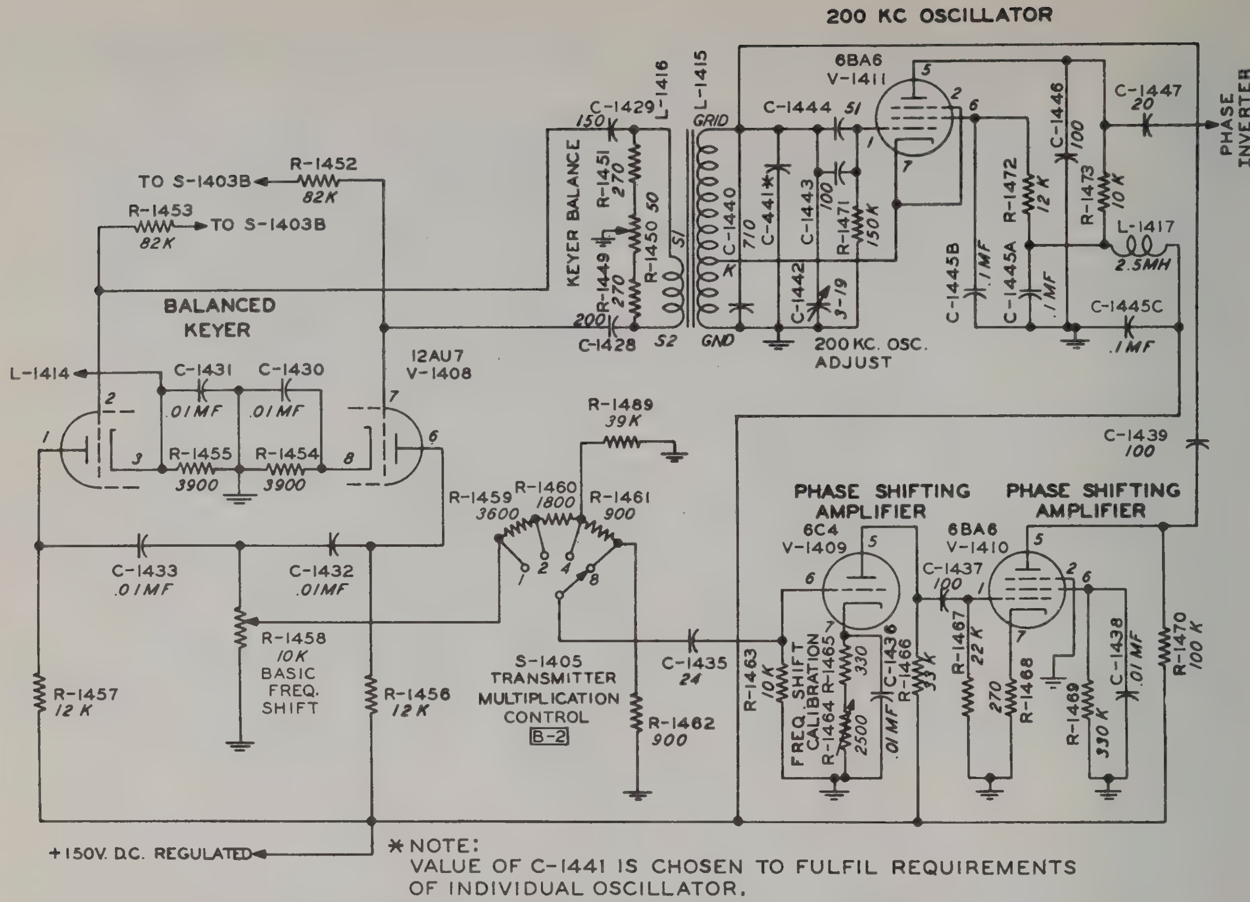


Figure 106. Frequency-Shift Keyer KY-45/FRT-5, 200-KC Oscillator, Balanced Keyer, and Phase-Shifting Amplifiers, Schematic Diagram.

and R-1467, brings about a 20° phase shift; and the resulting voltage, represented by vector V1410G, is applied to V-1410, whose plate voltage is then represented by V-1410P. When this voltage is compared with the original oscillator vector, E_O, it may be seen that a lagging 90° relationship exists between these two voltages, and a leading, or capacitive, current flows in the oscillator tank, producing an effect much as if an additional capacitor had been placed across L-1415, resulting in a lower frequency.

(b) When the bias voltage, applied to the grid of the section of V-1408 which is allowed to vary in amplification, is made more negative than that of the constant-amplification section, the vector relationships will be as shown in F. Vector V-1408P_2 is smaller than V-1408P_1, and the resultant vector appears in H. This vector encounters a phase shift through C-1435 and R-1463 so that the vector relationships exist as shown in I. After passing through V-1409, the voltages appear as shown in J. Here, the voltage V-1410P leads the oscillator voltage; and a lagging current flows, which adds to the inductive current in the oscillator tank, effectively reducing the circuit capacity and raising the frequency. The condition shown in E corresponds to radiotelegraph mark, because it is effective in lowering the frequency of the 200-kc oscillator (raising the final output frequency). The condition shown in J corresponds to space, because it raises the frequency of the 200-kc oscillator (lowering the final output frequency). The circuit constants are so chosen that a linear change in keyer-tube grid voltage produces a linear frequency shift.

(c) The magnitude of the reactive voltage (that is, frequency shift) can be changed by the adjustment of potentiometer R-1458. Further division of this voltage

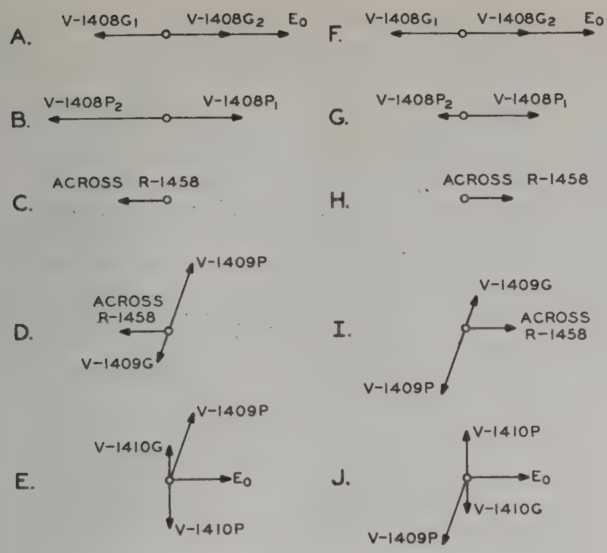


Figure 107. Frequency-Shift Keyer KY-45/FRT-5, Vector Diagrams.

is possible through the use of the TRANSMITTER MULTIPLICATION switch S-1405, the function of which will be explained later.

(d) Thus, under the control of the keyer tube, it is possible to produce either a leading or a lagging voltage at the plate of V-1410. This is equivalent to adding inductance or capacitance in its effect on the oscillator frequency. The control R-1458, then, provides a means by which the total amount of frequency shift can be adjusted. Because the amount of frequency shift which is present in the associated transmitter is dependent upon the degree of multiplication to which the output of this keyer is subjected, it is necessary to reduce the amount of frequency shift by means of control S-1405. This switch provides for full shift, one-half shift, one-quarter shift, and one-eight shift to provide for multiplication by one, two, four, and eight in the associated transmitter. To calibrate the frequency-shift control R-1458, an adjustment in the gain of the amplifier is provided by the cathode potentiometer, R-1464. Because of slight differences in the keyer tube gain characteristics and in circuit wiring, a balancing control, R-1450, is provided to equalize the outputs of the two sections of the keyer tube when the d-c voltages applied to the two grids are identical. A small amount of adjustment of the oscillator frequency is possible through adjustment of C-1442. Because of the temperature-controlled oven and the high

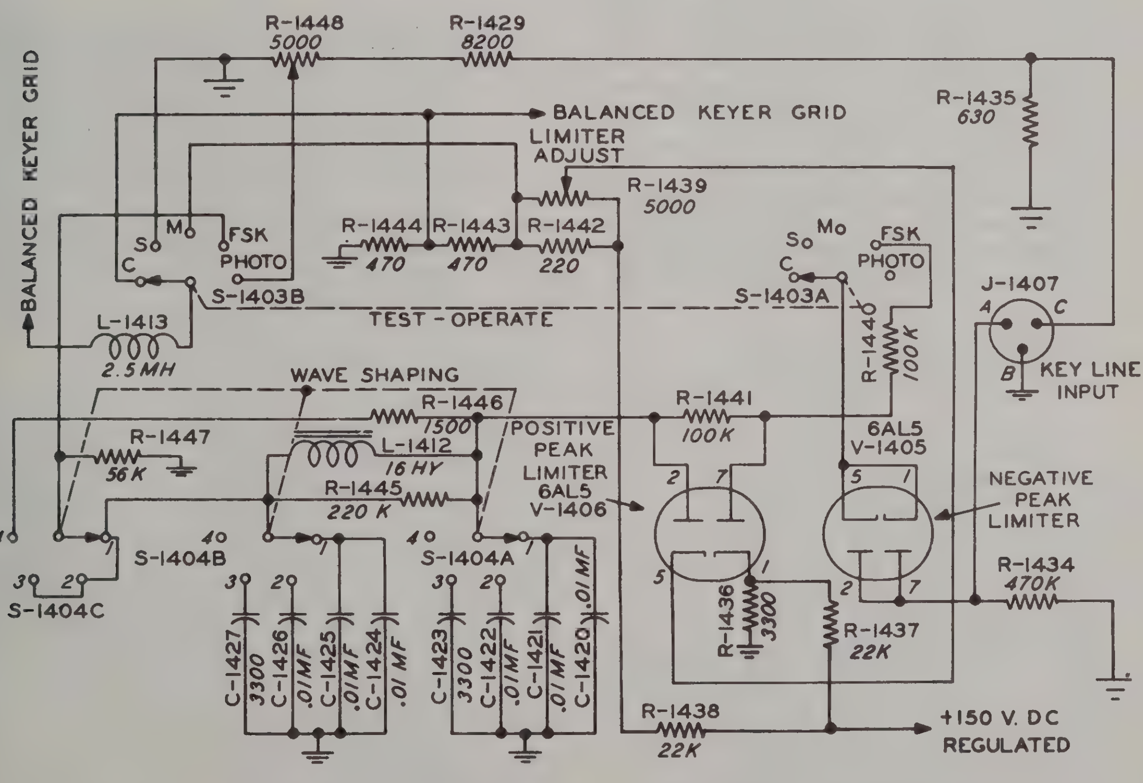


Figure 108. Frequency-Shift Keyer KY-45/FRT-5, Limiters and Wave-Shaping Filter, Schematic Diagram.

inherent stability of the circuit, adjustment of this control is unnecessary for extended periods of time.

(4) *200-kc filter and phase inverter.* Fig. 105 shows the 200-kc filters and the phase inverter in simplified form. Because harmonics of the 200-kc oscillator fall within the pass band of the high-frequency circuits of this keyer, these harmonics must be suppressed to eliminate spurious output. This is done with low-pass filters consisting of C-1448, C-1449, C-1450, L-1418 and L-1419. This filter passes the fundamental with very little attenuation, but offers a high degree of rejection in the second and higher harmonics of the 200-kc oscillator. The phase inverter tube, V-1412, serves to produce push-pull 200-kc voltage for application to the No. 3 grids of the balanced modulator tubes. This phase inverter employs a twin triode to secure push-pull output voltages.

(5) *Limiters and wave shaping filter (fig. 108).* Teleprinter or picture transmission signals are applied to the keyer line input connector J-1407. Teleprinter signals pass through negative peak limiter V-1405, providing only positive keying impulses at S-1403A. On the FSK position of S-1403A, a positive-peak limiter provides essentially fixed voltage having square-wave characteristics to the wave-shaping filter. The wave-shaping filter is a low-pass pi section. Through selecting the proper position of S-1404, it is possible to apply the desired amount of waveshaping to the square wave delivered by the limiter tubes. Waveshaping at this point materially reduces the side-band-frequency components which are present with square-wave keying. The TEST-OPERATE switch, S-1403, provides a means by which carrier, space-mark, FSK, or photo transmission of the keyer can be provided. In the CARRIER position, the input line is disconnected and the same voltage is applied to both keyer-tube grids. This results in voltages in phase opposition but of identical magnitude at the plates of the keyer tube so that essentially zero voltage appears across R-1458, resulting in the natural frequency of oscillation for the 200-kc oscillator. In the MARK position, a positive voltage is applied to the keyed grid of V-1408 (Pin 7), causing lower frequency of oscillation for the 200-kc oscillator, while in the SPACE position, the input line is disconnected, and zero voltage is applied to the keyed grid. Then the 200-kc oscillator operates at a higher frequency. On the FSK position, the input line is connected through the positive-peak limiter and into the keyed grid of V-1408 through the wave-shaping filter. For photo transmission, S-1403 connects the input line without the wave-shaping or positive-peak limiting to the keyed grid of V-1408. In photo transmission, the frequency of the 200-kc oscillator follows the keying voltage linearly. The key-line input connector is arranged so that separate lines for photo and FSK may be left permanently connected. The proper line is then automatically selected by the TEST-OPERATE switch.

(6) *Phase-modulation oscillator (fig. 109).* The phase-modulation oscillator is a simple Hartley oscillator tuned to 200 cycles. This 200-cycle oscillator provides a voltage across R-1455 such that up to one radian of phase modulation (at 850 cycles total shift) is possible on the output signal. The use of phase modulation permits frequency diversity, which is a decided advantage in the presence of severe multipath distortion in radio transmission.

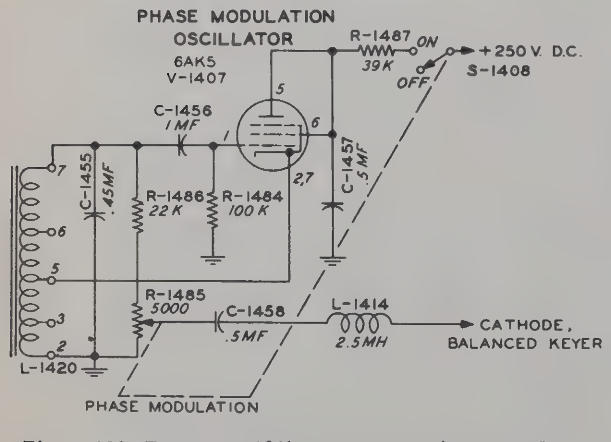


Figure 109. Frequency-Shift Keyer KY-45/FRT-5, Phase-Modulation Oscillator, Schematic Diagram.

d. Power Supply PP-454/FRT-5 (fig. 242).

(1) Power Supply PP-454/FRT-5 provides the filament, bias, and plate potentials necessary for the operation of Frequency Shift Keyer KY-45/FRT-5 and the R-F Oscillator O-91/FRT-5. Two separate power supplies are incorporated. One furnishes voltage for R-F Oscillator O-91/FRT-5. This power supply includes a full-wave rectifier using two 5R4GYW rectifiers. The filter system employs choke input and utilizes two 10-uf capacitors on the output. A type OA2 voltage regulator is used for voltage stabilization. One hundred and fifty volts regulated and 250 volts unregulated are supplied to the r-f oscillator.

(2) The other power supply furnishes the voltage for Frequency Shift Keyer KY-45/FRT-5. This power supply is a full-wave type using a single 5R4GYW rectifier and a 2-section choke-input filter. A type OA2 regulator tube is used to stabilize the voltage. This unit has an additional voltage supply which uses a 6X4 rectifier tube and an RC filter network system. The voltage output from this supply is negative 100 volts. One hundred fifty volts regulated and 250 volts unregulated are supplied to Frequency Shift Keyer KY-45/FRT-5. Power Supply PP-454/FRT-5 incorporates a voltmeter and switching arrangement.

54. Transmitter Proper

a. General. The r-f portion of the basic transmitter will be considered in the following order.

(1) *Radio Transmitter T-454/FRT-26.*

(a) Buffer and frequency multipliers.
(b) Electronic keyer.
(c) Driver.
(d) Intermediate power amplifier.
(e) Coupling network.

(2) *R-F Amplifier AM-738/FRT-22.*

(a) Power amplifier.
(b) Output network.

(3) *Radio Transmitter T-454/FRT-26 and R-F Amplifier AM-738/FRT-22.*

(a) Servo tuning system.
(b) Metering and monitoring system.

b. Radio Transmitter T-454/FRT-26.

(1) *Buffer and frequency multipliers (fig. 110).*

(a) The first stage in the transmitter is a broadband buffer stage. Employing a 6AG7 tube (V-501), this stage provides the necessary voltage gain and isolation between the exciters and the first frequency multiplier. Exciting input line voltage is coupled to the buffer grid by a 50-ohm coaxial input line and autotransformer T-501. The coaxial line is loaded by a group of four resistors, R-501 through R-504, to provide a fixed load for the exciters, while the autotransformer raises the voltage applied to the grid by a factor of approximately 2. A second coaxial line is coupled through C-501 to the buffer grid. The line extends to external jacks and provides a means for frequency monitoring.

(b) The plate circuit of the buffer contains only an r-f choke, L-501, and is capacity coupled to the grid of the first multiplier stage, V-502.

(c) The first multiplier, an 807, has a tuned plate circuit consisting of L-503 and C-511. Both the capacitor and inductor are variable. They are coupled together mechanically and varied simultaneously by a tuning motor. These two components and their gearing are assembled as a small unit and will cover the frequency range 4000 to 13,000 kc. Since the oscillator-buffer output is in the range 2000 to 4000 kc, the first frequency multiplier is intended for doubling, tripling, or quadrupling the input frequency.

(d) The output of the first multiplier is capacity coupled to the grid of the second multiplier V-503, also an 807. The plate tank of the second multiplier is composed of C-517 and L-506, and is identical to that of the first multiplier except for its frequency range, which is 4000 to 26,000 kc. This multiplier is used as a doubler or straight-through amplifier.

(e) The r-f output of the second multiplier is capacity coupled to the grid of the type 4-400A driver tube, V-504. The magnitude of this voltage, and therefore the grid current of the driver, may be controlled from the front panel by means of the R-F EXCITATION control. This control is a potentiometer, R-519, which varies the screen voltage and hence the output of the first multiplier tube, V502, and the second multiplier tube, V-503. A second drive control is also incorporated in the unit. This control, potentiometer R-522, is mechanically linked to L-506 and C-517, the second multiplier tank, and is automatically positioned when the tank is tuned. It controls the second multiplier grid bias so that it is maximum at the lowest frequency and minimum at the highest frequency of operation.

(2) *Electronic keyer (fig. 111).*

(a) On-off keying is accomplished by controlling the bias of the first buffer, V-501, and the first frequency multiplier, V-502, in accordance with the keying impulses. Bias for these two tubes is obtained from a tap near the electrical zero voltage point of a voltage divider connected between the negative 400-volt bias supply and the positive 600-volt low-voltage supply. This divider circuit is so proportioned that the voltage from its center resistance R-560 to ground is zero. R-560 is a potentiometer mounted on the

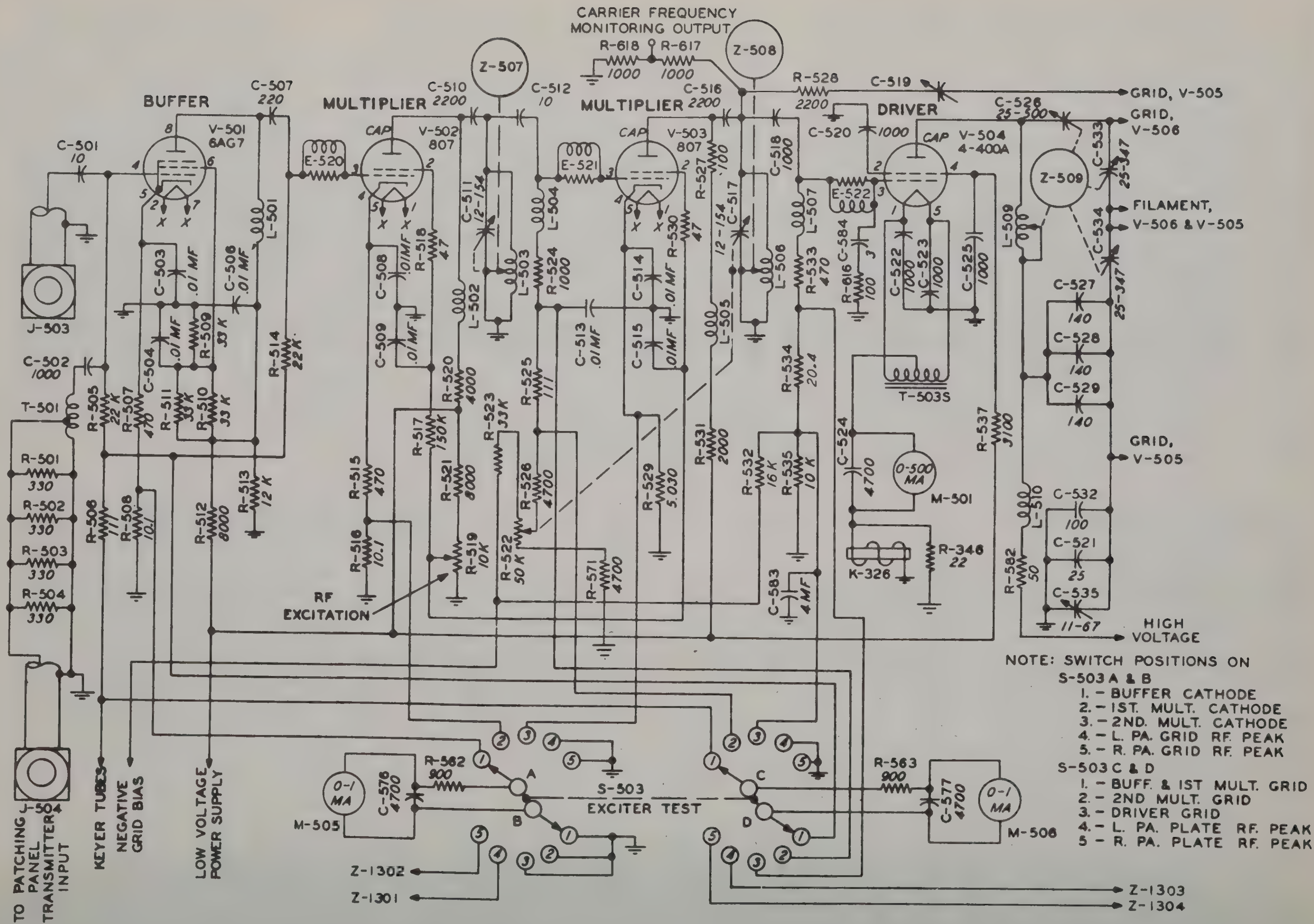


Figure 110. Radio Transmitter T-454/FRT-26, Buffer, Multipliers, and Driver, Schematic Diagram.

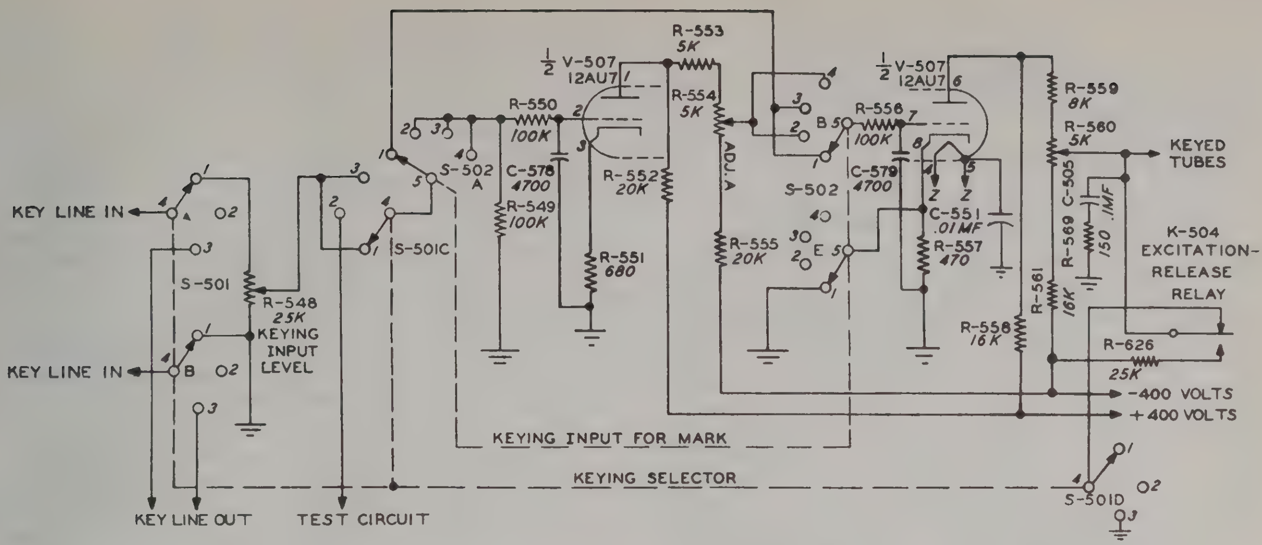


Figure 111. Radio Transmitter T-454/FRT-26, Electronic Keyer, Schematic Diagram.

control panel of the electronic keyer and designated **KEYER OUTPUT**. This control allows an exact adjustment to zero voltage output from this divider, which corresponds to "carrier-on" condition. A keyer tube, V-507, a 12AU7 dual triode, is connected to a tap on the positive side of this divider in such a manner that current drawn by one section will upset the dividing ratio and consequently cause the voltage at the tap to become negative with respect to ground. Note that the voltage divider consists of R-558, R-559, R-560, and R-561 in series. Current flowing to the 12AU7 second section plate will add to any current that was already flowing in R-558 and therefore cause the junction of R-558 and R-559, which is also the 12AU7 plate voltage, to shift in the negative direction. This results in a negative voltage being applied to the keyed tubes, which causes plate current cutoff and therefore a "carrier off" condition. During the period that the preset tuning control circuits are in operation, tuning the transmitter, excitation release relay K-504 is energized, thus applying blocking bias to the keyed stages, through R-626, from the -400 volt supply.

(b) This keyer will accept keying impulses that are negative, positive, polar negative, or polar positive for mark. Since a negative voltage applied to the grid (pin 7) of the second section will produce "carrier on" condition, only this section is used for negative or polar negative keying. The only difference between these two types of keying is that for polar negative keying, a cathode resistor, R-557, is inserted to produce a positive cathode bias. This allows the tube to operate class A so that the grid is affected by voltage swings in both directions. In order to accept positive keying impulses, a phase-inversion stage is inserted ahead of the keyer. This stage utilizes half of the 12AU7 and has a voltage gain of one. The entire keyer is direct coupled. A variable resistor, R-554, is used in the output section of the first, or phase inverter half of this keyer to allow adjustment of the average d-c voltage applied to the second section of the keyer by the phase-inverting section. The porcedure for making this adjustment is simple and is explained in a later section.

(c) Although it would be possible to manually key the transmitter by using a test key to ground the output of this keyer and thus turn on the carrier, there would be no assurance that the keyer itself were functioning properly. A keying test voltage is therefore applied to the keyer input through the contacts of the test keys for manual keying. Since there are four choices of keying impulses that will operate this keyer, the test keying circuit must deliver voltage to suit the requirements of each. The circuit shown in fig. 112 consists of a network of resistors connected as voltage dividers between the negative 400-volt and the positive 600-volt power supplies. By appropriate choice of resistance values, 50 volts for mark with the required polarization is made available at the test key terminals. The required test-keying voltage is automatically set up by the selector switch,

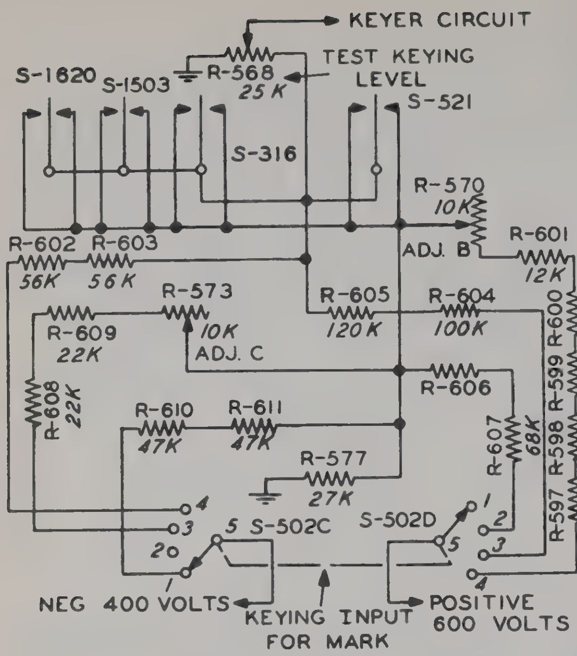


Figure 112. Radio Transmitter T-454/FRT-26, Electronic Keyer, Test Keying Circuit, Schematic Diagram.

which sets up the keyer itself for a given type of keying impulse. This switch is operated from the front panel of the keyer.

(3) *Driver (fig. 110).*

(a) The driver stage, V-504, employs a type 4-400A high-gain tetrode tube. It amplifies the signal from the second multiplier sufficiently to drive the push-pull intermediate amplifier. Although the 4-400A is a well-shielded screen-grid tube, some neutralization is required. To provide this neutralization, C-519 feeds back a small amount of out-of-phase voltage.

(b) A single coupling circuit provides a high-impedance load for the driver and delivers push-pull excitation voltage to the low-impedance grids of the intermediate power amplifier. A constant voltage ratio of about 5 to 1 is maintained between the driver r-f plate swing and the intermediate amplifier grid swing. These functions are performed simultaneously and uniformly over the full 4000 to 26,000 kc range by a single coupling circuit. A single motor drives all the components.

(c) To better explain the method of obtaining push-pull excitation from this circuit, fig. 113 is used. For this discussion, only the equivalent r-f circuit is necessary so that the d-c blocking capacitors designated as C-527, C-528 and C-529 may be considered as being short circuited. The inductive branch of the tank may be thought of as consisting of L-509 and C-534 in series. The capacitive branch may be thought of as C-526 and C-533 in series. Since the tank-current flow through these capacitors is in opposite directions, the voltages developed across them will be 180° out of phase. Capacitors C-533 and C-534 are equal, and will develop equal voltages, provided the current through them is identical. To insure this identity, balancing capacitors C-521, C-532 and C-535 are connected in parallel and to ground from one side of C-534. This balancing capacitance provides a return path for the current, which flows to ground through the driver tube output capacitance.

(d) The variable inductor L-509, the variable capacitor C-526, and the variable loading capacitors C-533 and C-534 are geared together and are simultaneously varied by a servo motor drive to tune the circuit across the frequency range.

(4) *Intermediate power amplifier (fig. 114).*

(a) The intermediate power amplifier is a grounded cathode, cross-neutralized push-pull class C amplifier. It utilizes two air-cooled type 3X2500A3 triodes, V-505 and V-506. An oscillation is inherent in this stage in the vicinity of 50 mc. At this frequency the neutralization circuit feedback can be excessive because of the series inductance of the neutralizing capacitor and its leads. For this reason, the neutralizing leads of the intermediate power amplifier contain os-

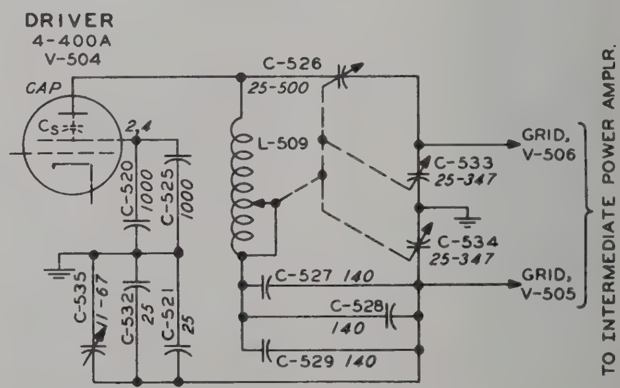


Figure 113. Radio Transmitter T-454/FRT-26, Coupling Circuit, Driver to Intermediate Power Amplifier, Simplified Diagram.

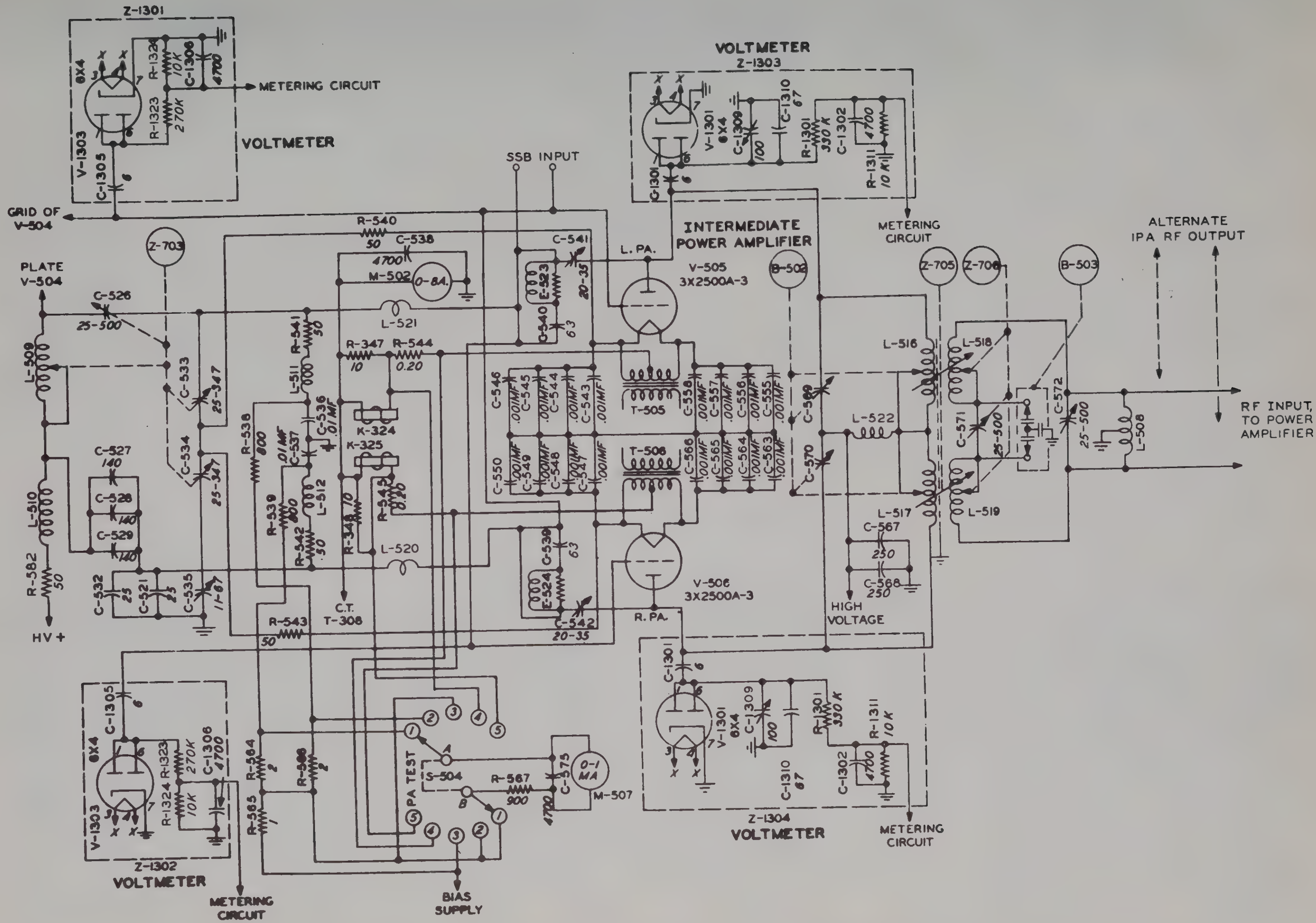


Figure 114. Radio Transmitter T-454/FRT-26, Intermediate Power Amplifier Stage, Schematic Diagram.

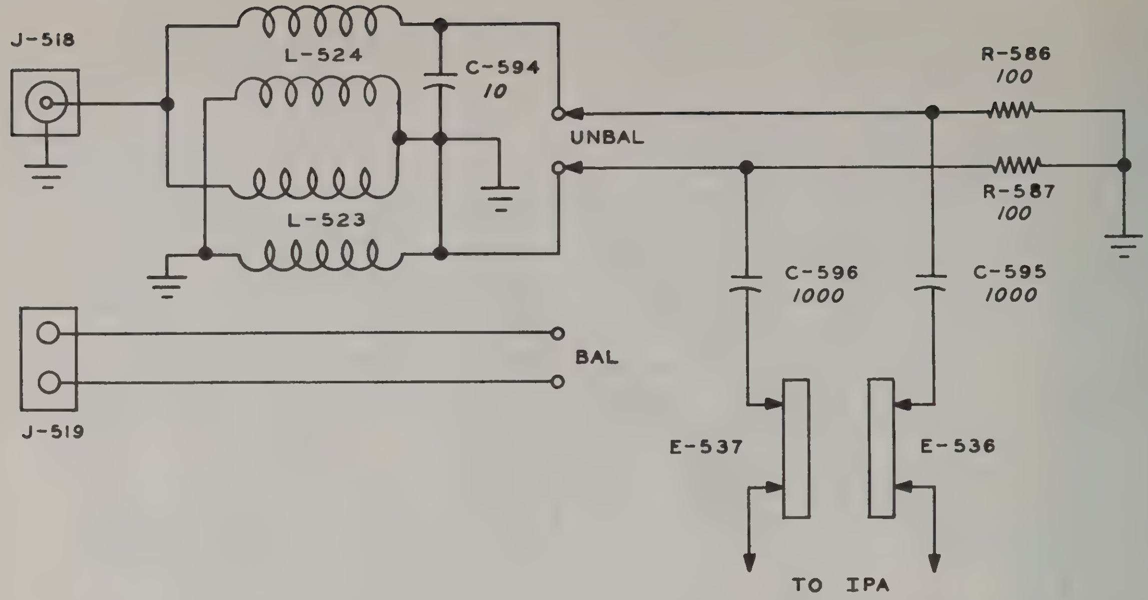


Figure 115. Radio Transmitter T-454/FRT-26, Single-Sideband Input Circuit, Schematic Diagram.

cillation suppressors composed of C-529, C-540, E-523, E-524 and two shunting copper straps. These suppressors are made resonant at the frequency to be suppressed. This effectively reduces the excessive neutralizing feedback at the undesired frequency and hence suppresses oscillation.

(b) The plate tank of the intermediate power amplifier consists of a push-pull, balanced, parallel-resonant circuit composed of capacitors C-569 and C-570 and inductors L-516 and L-517. These inductors and capacitors are continuously variable and simultaneously driven by a tuning motor. The circuit is variable over the entire frequency range, 4000 to 26,000 kc, with a nearly constant Q.

(5) *IPA conversion for linear amplification.* The circuit that is normally employed at the grids of the intermediate power amplifier is designed to present a high-impedance load to the 4-400A driver tube and to deliver balanced push-pull voltage to the low-impedance grid circuit of the IPA. This is not a suitable circuit for accepting drive from an external single-sideband suppressed-carrier transmitter. Therefore, the intermediate power amplifier must be modified slightly for such operation. Fig. 115 is a simplified schematic of the intermediate power amplifier input circuit following conversion for linear amplifier operation.

(a) Placing single-sideband coupling links E-545.1 and E-545.2 in their clips (see fig. 54) connects the grids of the IPA tubes to the input coupling circuit. The

DRIVER PLATE TUNING control $\boxed{C}$

is used to tune the IPA grid circuit to resonance. In single-sideband operation, the driver filament is de-energized to prevent it and previous stages from acting on the following circuits. Two input circuits have been provided for matching the IPA grid circuit to the output of an SSB exciter; a balanced input, terminated in a swamping resistance composed of R-586 and R-587, is provided for use with the Western Electric D-156000 or other similar equipment which has a 200-ohm balanced output. This circuit is coupled to the IPA grids through isolating capacitors C-595 and C-596. If an exciter is to be used which has a 52-ohm unbalanced output, it should be connected to the 52-ohm SSB input jack J-518, and the procedure outlined in Chapter 2, paragraph 34, as applicable, should be followed. Inserting plug P-532 in the front position in J-532 connects the 52-ohm input, through an impedance-matching balun circuit consisting of inductors L-523 and L-524 and capacitors C-594, to the 200-ohm input line.

(b) It is necessary to operate the IPA as a class B stage in order to obtain the required linear amplification with reasonable efficiency. Ordinarily the intermediate power amplifier is operated as a class C stage, biased to about twice the

cutoff voltage, -280 volts. With class B operation, however, plate current must flow for 180°, or half of each cycle. Thus the intermediate power amplifiers must be biased just to cutoff. This condition is met after the modification is complete. Under these conditions, and with no grid signal, the static plate current is almost zero. With excitation, the plate signal will be an exact replica of the input grid signal.

(c) A careful adjustment of the drive voltage and loading is required in order to produce this linear relationship. The tuning procedure for single-sideband operation, given in paragraph 20, assures that these conditions will be met. However, a short explanation of what is to be accomplished during tuning may help to clarify both the theory and the tuning procedure.

(d) In any amplifier the maximum peak r-f plate voltage that can be developed is always less than the applied d-c plate voltage. Conventional triodes in class C usually develop between .8 and .9 of their d-c plate voltage.

(e) For linear amplifier operation, the plate current and the peak r-f plate voltage must be linearly related to the peak r-f grid voltage. Plate load resistance, r-f drive voltage, and bias must be carefully balanced to obtain this linear condition while at the same time delivering a maximum of useful output power. Since the peak r-f plate voltage swing is pretty well established regardless of operating conditions, variation of the load resistance must be accompanied by an equal variation in the r-f plate current to maintain this voltage. This means that for linear operation, a range of linear grid-voltage plate-current conditions must be found and utilized. The low or zero-voltage point is determined by the operating bias, which, in the case of a class B linear amplifier, is slightly above plate-current cutoff. Departure from linearity at the maximum voltage end is usually the result of a grid voltage that is positive and approaching the instantaneous value of the plate voltage, thus deflecting many of the electrons from their intended destination at the plate to the grid. This, of course, increases the grid current and requires considerable power from the driving source. A limit of maximum grid swing must be chosen that is sufficiently lower than this so that the linear grid-voltage plate-current relation still exists. At this operating condition, maximum r-f grid swing, maximum r-f plate swing, and maximum r-f plate current occur simultaneously. Steady operation under this condition is usually not possible because of excessive plate dissipation; so actual adjustments requiring a steady carrier must be made at reduced operating conditions. Usual practice in AM service is to adjust for 1/2 value of both grid and plate swings, so that the full range of the tube's capabilities will be utilized at 100 percent modulation, when all voltages double. This is accomplished by setting the grid voltage to a value which is predetermined to be 1/2 of the linear swing capability and adjusting the plate load until 1/2 of the maximum plate RF swing exists. Power output under this condition is then 1/4 (since voltages are 1/2 and power varies as square of voltage) of the peak available power.

(f) Similar reasoning can be made in the case of the single sideband adjustment, except it is not necessary to adjust operating points to 1/2 as indicated above. One-sixth or some other fraction might be chosen so long as the plate and grid swings are adjusted to the same fraction of the respective maximum values. A value of 1/2 is suggested because the same settings can also be used for AM linear amplifier operation.

(g) Peak-reading r-f voltmeters are permanently installed on the r-f tank circuits to facilitate these adjustments.

(h) It is very important that the values given in paragraph 20 under Tuning Procedure be properly set up. If the grid swing is set to less than the recommended value, the plate swing could still be easily adjusted to the value shown, thus keeping within the dissipation rating of the tube. If this were done, the intermediate power amplifiers would be under-loaded, which would mean that the power output would decrease and the efficiency increase. On the other hand, if the peak grid swing were made greater than the recommended value, it would be necessary to load the IPA more heavily. The decrease in the load resistance increases the power output but decreases the efficiency of the stage. Optimum power output at a reasonable value of efficiency will be obtained if the grid and plate swings are properly adjusted as described.

(6) *Coupling circuit.* The coupling circuit is a parallel resonant circuit consisting of two

oppositely-wound inductors, L-518 and L-519, and two variable capacitors, C-571 and C-572. This coupling unit is mounted on a platform which is suspended from rails in the top of Radio Transmitter T-454/FRT-26. The position of this platform, as varied by a chain drive and motor, governs the amount of coupling between the plate tank and the inductors of the coupling network. This coupling circuit is used to couple to the very-low impedance input of the power amplifier stage.

(a) The input capacity, C-1585 and C-1586, of the power amplifier is shunted across the coupling circuit. The dissipating load is actually the cathode circuit of the power amplifier, which is connected across the two input capacitors. The impedance of this load is approximately 100 ohms. The coupling lines from Radio Transmitter T-454/FRT-26 to R-F Amplifier AM-738/FRT-22 introduce some inductance into the network. This coupling line inductance and the two input capacitors C-1585 and C-1586 can be considered as a simple L network following the parallel resonant circuit of the coupling network. The capacitors C-1585 and C-1586 are adjusted during operation so that the capacitive reactance is always approximately 25 ohms. They then provide a low-impedance return path to the cathode for the PA plate-current pulses.

(b) The input impedance to the L network varies directly with frequency, being low at the low-frequency end of the range, and increasing as the frequency increases. At the high frequencies, loading is not a problem because of the higher input impedance. The Q is sufficiently high at these frequencies with C-571 shorted to ground by means of grounding switch $\boxed{G}$

At the low frequencies (below 10 mc or so) the input impedance, and consequently the Q, is so low that in order to achieve proper loading it becomes necessary to operate grounding switch $\boxed{G}$ to the OFF position, thereby placing C-571 in the circuit. This action changes the LC ratio and raises the circuit Q, which results in better loading.

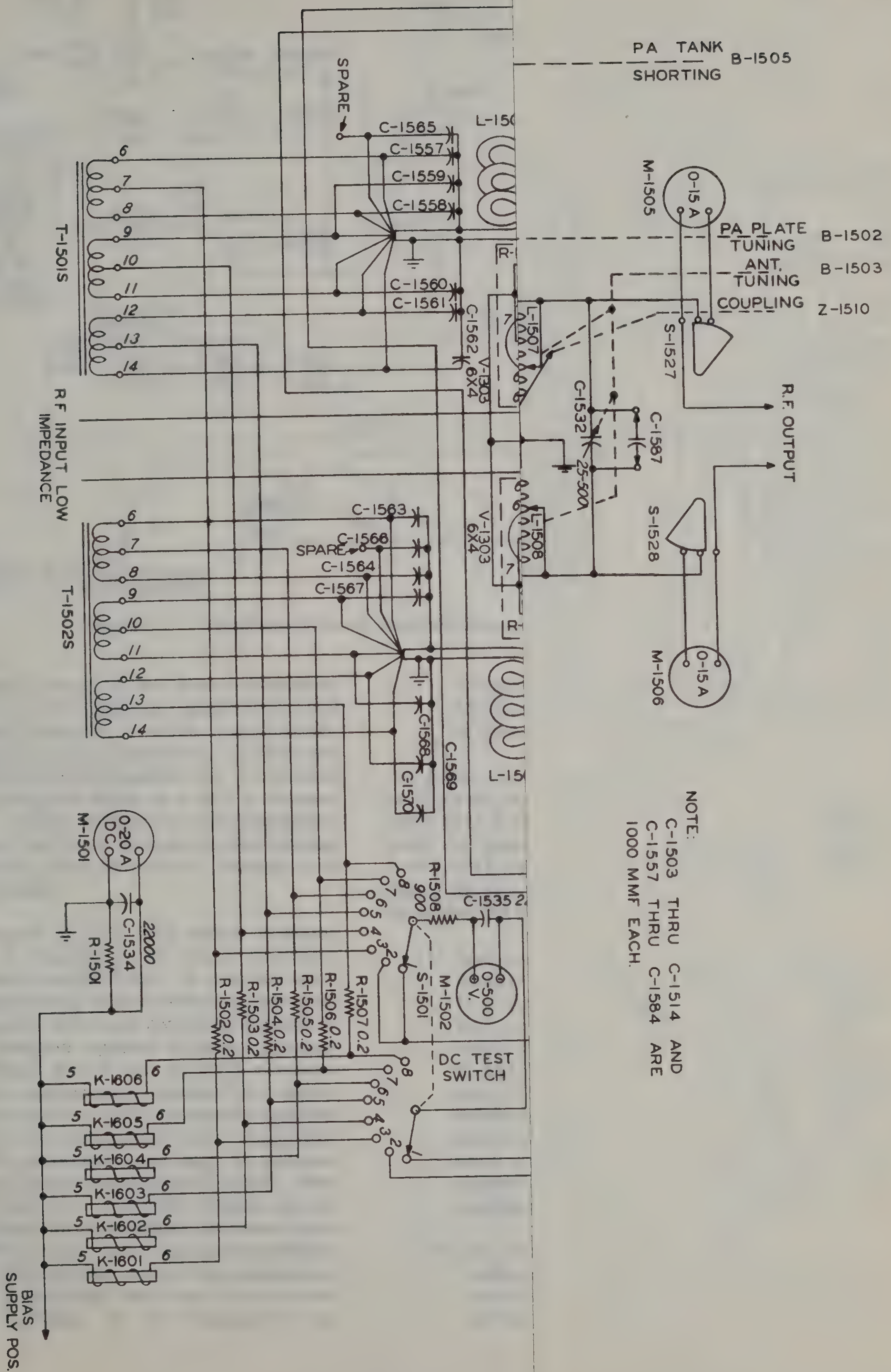
c. R-F Amplifier AM-738/FRT-22.

(1) *Power amplifiers (fig. 116).* The power amplifier is a push-pull grounded-grid amplifier. Three type 3X2500A3 tubes, V-1501 through V-1503, are connected in parallel, and this group is connected in push-pull with three more 3X2500A3 tubes, V-1504 through V-1506, in parallel. Excitation is fed from the intermediate power amplifier to the cathodes of the six power amplifier tubes through coupling capacitors C-1503 through C-1514. Rather than using twelve separate r-f chokes to prevent the drive voltage from being short circuited through the filament transformers, a method was used which requires only two chokes. The six wires associated with each set of three paralleled filaments were bound into a cable with one additional wire added to make the cable round. This cable of seven wires was passed through a length of copper tubing, which was then wound into a coil, thereby providing a high-impedance choke for these leads. These chokes are designated L-1501 and L-1502. The ends of the seventh wire in each of the cables have been tied to a terminal board and may be used should one of the active wires fail. The bias for the stage is obtained from the main bias supply.

(a) The cathode circuit contains two variable capacitors, C-1585 and C-1586. These two capacitors are positioned at each operating frequency to an approximate setting as determined from Figure 46. Their function is to provide a low-impedance return path to the cathode circuit for the plate-current pulses. They are set to provide approximately 25 ohms of reactance at all frequencies.

(b) Since the stage is operating grounded grid, no neutralization is necessary. Rather special means have been taken to insure that the grids of the amplifier tubes remain at ground potential. It is a basic requirement of grounded grid amplifiers that the grid be the true neutral separating plane between the input and output circuits. If this condition can be met, the amplifier will be stable without any form of neutralization.

(c) The grid bypass capacitance consists of two circular aluminum plates and the bottom plate of the cathode enclosure. The lower circular plate is grounded directly to the cathode enclosure; the upper plate is sandwiched between the other two, and separated by two thin sheets of Teflon. On this upper plate are mounted the three contact rings into which the grid rings of three of the power-amplifier tubes fit. There are two of these assemblies, designated C-1515 and C-1516.



PA TANK SHORTING B-1505
PA PLATE TUNING B-1502
ANT. TUNING B-1503
COUPLING Z-1510
M-1505
0-15 A
S-1527
R.F. OUTPUT
S-1528
M-1506
0-15 A
NOTE:
C-1503 THRU C-1514 AND
C-1557 THRU C-1584 ARE
1000 MMF EACH.
SPARE
C-1565
C-1557
C-1559
C-1558
C-1560
C-1561
C-1562
T-1501S
T-1502S
V-1303
6X4
L-1507
L-1508
C-1532
25-500
C-1587
RF INPUT LOW IMPEDANCE
C-1563
C-1566
C-1564
C-1567
C-1568
C-1569
C-1570
M-1501
0-20 A DC
C-1534
22000
R-1501
R-1508
900
C-1535
M-1502
0-500 V.
S-1501
DC TEST SWITCH
R-1502 0.2
R-1503 0.2
R-1504 0.2
R-1505 0.2
R-1506 0.2
R-1507 0.2
K-1606
K-1605
K-1604
K-1603
K-1602
K-1601
BIAS SUPPLY POS.

oppositely-wound inductors, L-518 and L-519, and two variable capacitors, C-571 and C-572. This coupling unit is mounted on a platform which is suspended from rails in the top of Radio Transmitter T-454/FRT-26. The position of this platform, as varied by a chain drive and motor, governs the amount of coupling between the plate tank and the inductors of the coupling network. This coupling circuit is used to couple to the very-low impedance input of the power amplifier stage.

(a) The input capacity, C-1585 and C-1586, of the power amplifier is shunted across the coupling circuit. The dissipating load is actually the cathode circuit of the power amplifier, which is connected across the two input capacitors. The impedance of this load is approximately 100 ohms. The coupling lines from Radio Transmitter T-454/FRT-26 to R-F Amplifier AM-738/FRT-22 introduce some inductance into the network. This coupling line inductance and the two input capacitors C-1585 and C-1586 can be considered as a simple L network following the parallel resonant circuit of the coupling network. The capacitors C-1585 and C-1586 are adjusted during operation so that the capacitive reactance is always approximately 25 ohms. They then provide a low-impedance return path to the cathode for the PA plate-current pulses.

(b) The input impedance to the L network varies directly with frequency, being low at the low-frequency end of the range, and increasing as the frequency increases. At the high frequencies, loading is not a problem because of the higher input impedance. The Q is sufficiently high at these frequencies with C-571 shorted to ground by means of grounding switch $\boxed{G}$

At the low frequencies (below 10 mc or so) the input impedance, and consequently the Q, is so low that in order to achieve proper loading it becomes necessary to operate grounding switch $\boxed{G}$ to the OFF position, thereby placing C-571 in the circuit. This action changes the LC ratio and raises the circuit Q, which results in better loading.

c. R-F Amplifier AM-738/FRT-22.

(1) *Power amplifiers (fig. 116).* The power amplifier is a push-pull grounded-grid amplifier. Three type 3X2500A3 tubes, V-1501 through V-1503, are connected in parallel, and this group is connected in push-pull with three more 3X2500A3 tubes, V-1504 through V-1506, in parallel. Excitation is fed from the intermediate power amplifier to the cathodes of the six power amplifier tubes through coupling capacitors C-1503 through C-1514. Rather than using twelve separate r-f chokes to prevent the drive voltage from being short circuited through the filament transformers, a method was used which requires only two chokes. The six wires associated with each set of three paralleled filaments were bound into a cable with one additional wire added to make the cable round. This cable of seven wires was passed through a length of copper tubing, which was then wound into a coil, thereby providing a high-impedance choke for these leads. These chokes are designated L-1501 and L-1502. The ends of the seventh wire in each of the cables have been tied to a terminal board and may be used should one of the active wires fail. The bias for the stage is obtained from the main bias supply.

(a) The cathode circuit contains two variable capacitors, C-1585 and C-1586. These two capacitors are positioned at each operating frequency to an approximate setting as determined from Figure 46. Their function is to provide a low-impedance return path to the cathode circuit for the plate-current pulses. They are set to provide approximately 25 ohms of reactance at all frequencies.

(b) Since the stage is operating grounded grid, no neutralization is necessary. Rather special means have been taken to insure that the grids of the amplifier tubes remain at ground potential. It is a basic requirement of grounded grid amplifiers that the grid be the true neutral separating plane between the input and output circuits. If this condition can be met, the amplifier will be stable without any form of neutralization.

(c) The grid bypass capacitance consists of two circular aluminum plates and the bottom plate of the cathode enclosure. The lower circular plate is grounded directly to the cathode enclosure; the upper plate is sandwiched between the other two, and separated by two thin sheets of Teflon. On this upper plate are mounted the three contact rings into which the grid rings of three of the power-amplifier tubes fit. There are two of these assemblies, designated C-1515 and C-1516.

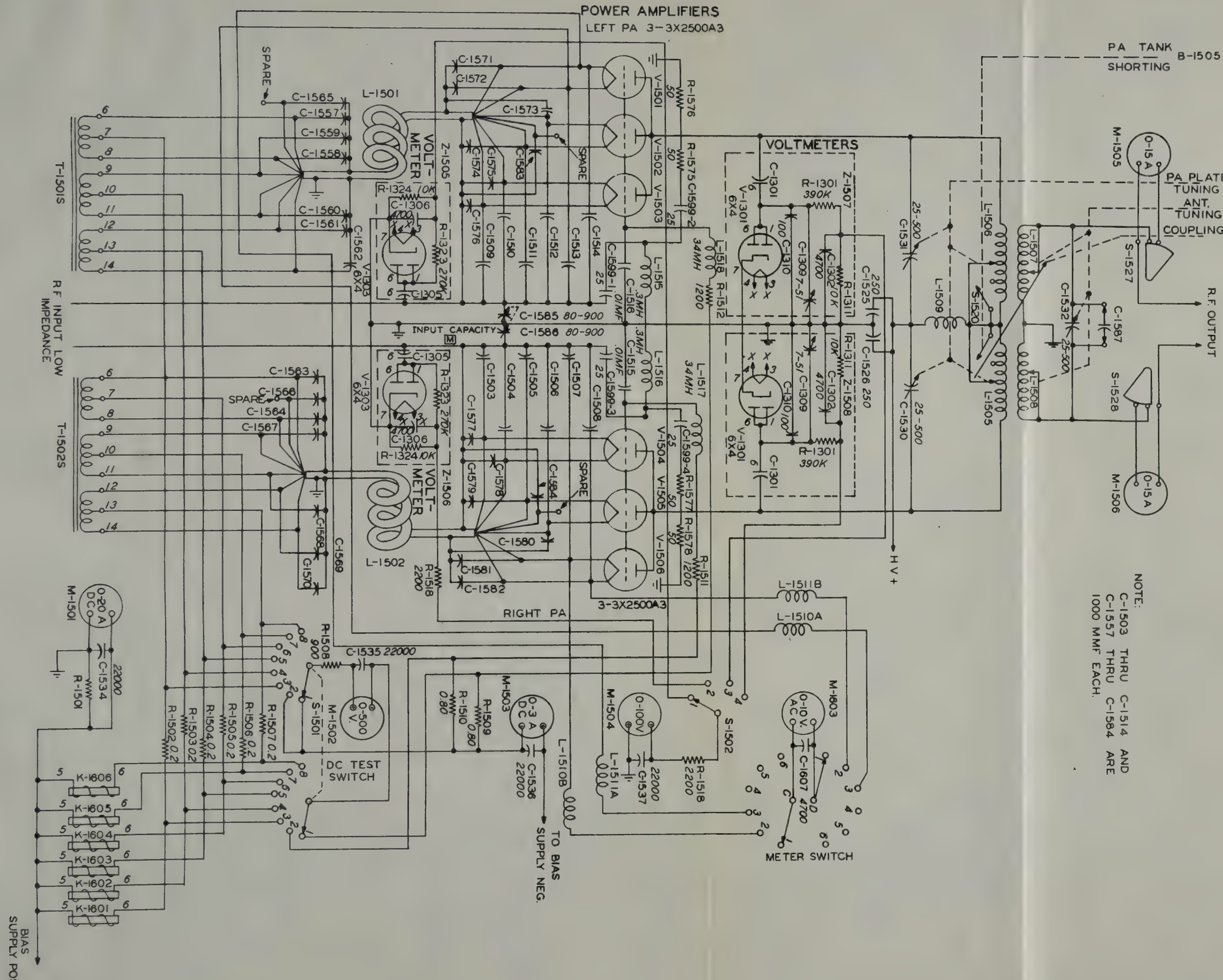


Figure 116. R-F Amplifier AM-738/FRT-22, Power Amplifier Stage, Schematic Diagram.

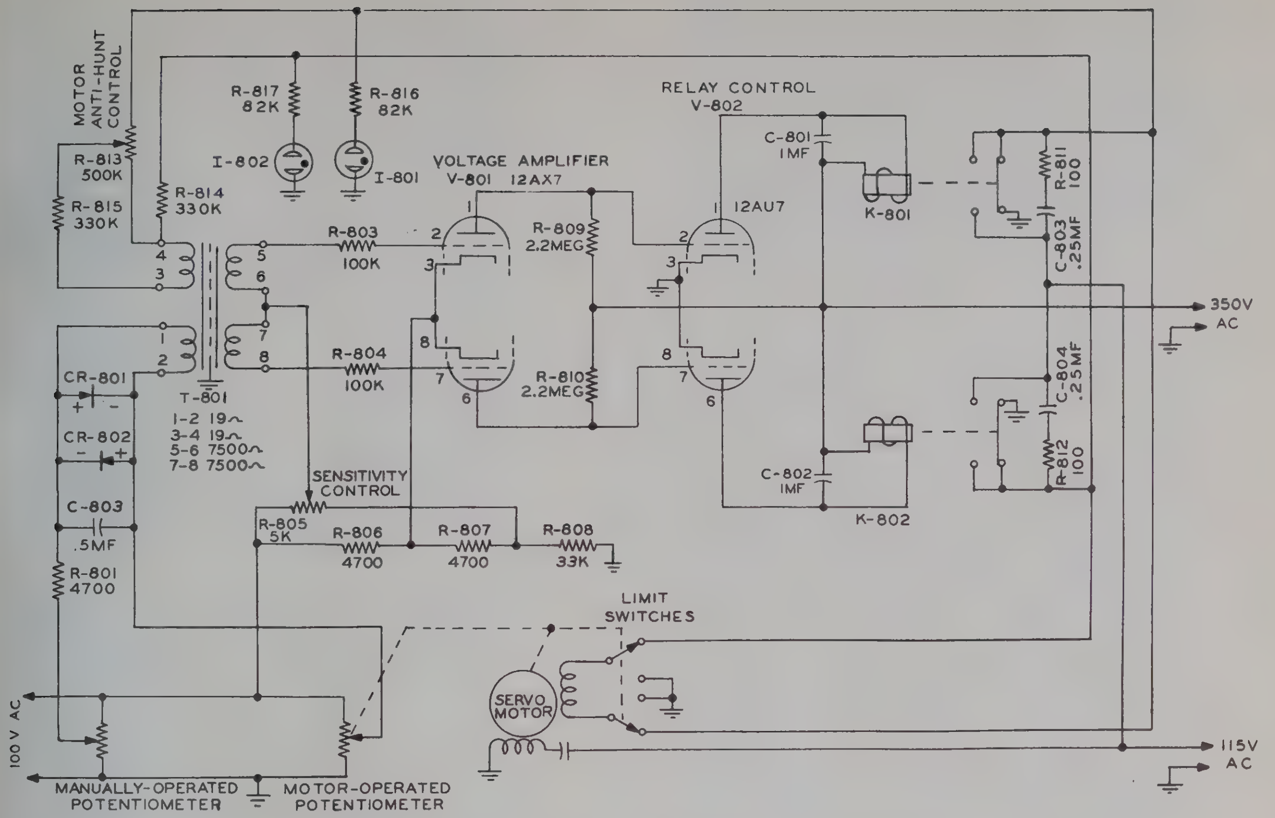


Figure 117. Servo Control System Simplified Schematic Diagram.

(d) The plate circuit of the power amplifier consists of a pair of oppositely-wound variable inductors, L-1505, and L-1506, and two vacuum capacitors, C-1531 and C-1532, coupled together by a common chain-and-gear drive in such a manner that a single motor can simultaneously vary all four components and change resonance continuously through the tuning range.

(2) *Output network (fig. 116).* The output coupling network is located at the top of R-F Amplifier AM-738/FRT-22. It consists of a pair of oppositely-wound variable inductors, L-1507 and L-1508, and a vacuum capacitor, C-1432, coupled together in such a manner that a single motor can vary the resonant frequency continuously through the entire range. As seen from the schematic diagram (fig. 116), an additional fixed capacitor, C-1587, is provided, and may be shunted across the variable capacitor C-1532. This fixed capacitor, C-1587, should only be needed when the transmitter is tuned up on 4 mc with a low value of line impedance. At this frequency and with a low-impedance load, the Q becomes too low to provide proper loading. As the frequency is increased, the Q becomes sufficiently high to provide adequate loading for all values of line impedance without the use of C-1587.

d. Radio Transmitter T-454/FRT-26 and R-F Amplifier AM-738/FRT-22. There are several features which are a part of the transmitter and which are essentially the same in both Radio Transmitter T-454/FRT-26 and R-F Amplifier AM-738/FRT-22. These include the tuning system and the provisions for metering and monitoring.

(1) *Servo tuning system.* Common features of Radio Transmitter T-454/FRT-26 and R-F Amplifier AM-738/FRT-22 are the servo amplifiers, servo drive units, and servo power supplies. Radio Transmitter T-454/FRT-26 uses one servo power supply, six servo amplifiers, and six servo drive units to position six tuned circuits in the bay. R-F Amplifier AM-738/FRT-22 uses one servo power supply, three servo amplifiers, and three servo drive units to position three tuned circuits in the bay.

(a) A complex system of switches, relays, and automatic positioners, called the preset tuning control circuits, operates to select the channel on which the servo

mechanisms are to set up. The preset tuning control circuits are discussed separately in paragraph 55; but a thorough understanding of the servo tuning system is necessary to an understanding of the preset tuning control system.

(b) Figure 117 will be used in the discussion of the servo tuning system. In this diagram, for purposes of simplicity only one servo amplifier, one servo control potentiometer, and one servo drive unit are shown.

(c) All variable resonant circuits in the transmitter are motor operated and are servo positioned from front-panel controls. A small reversible a-c motor is mechanically coupled to each of the variable circuits. The motor is controlled by a pair of relays, K-801 and K-802, located within the servo amplifier chassis. The servo positioning system is basically an a-c bridge circuit in which one branch consists of a variable voltage divider (or potentiometer) mounted on the control panel and set by the operator, while the other branch consists of a variable voltage divider mechanically coupled to the motor driven circuit. The bridge will always seek a balance by closing the appropriate motor relay until the balance is obtained.

(d) In order to increase the bridge sensitivity and therefore the setting accuracy, and also to give the sense to the bridge, a vacuum tube amplifier is used to operate the motor-control relays. This unit is called a servo amplifier. It consists of a push-pull voltage amplifier, V-801, followed by a push-pull relay control stage, V-802. The operating voltage for the bridge is 60-cps ac at approximately 100 volts. This voltage is applied to both the front-panel control and the motor-positioned control. Since both controls are voltage dividers, if they are identically positioned, the divider ratios will be alike and there will be no voltage difference between the variable arms. If, however, they are not identically positioned, the divider ratios will be different, and a voltage will be developed that is proportional to the difference in the positions of the arms. This difference voltage is applied to the grids of V-801. The plates of V-801 are coupled to the grids of the relay control tube V-802. This relay control tube operates with 60-cps a-c plate voltage. Both plates of V-802 are supplied by the same source so that their plate voltages are in phase. Since the grids are fed push-pull, the grid and plate of only one section will be positive at the same time. Therefore only one section will draw current at any given time. The section of V-802 which draws current and closes the motor relay depends on the phasing of the voltage fed to the amplifier from the bridge. The appropriate relay will therefore operate to bring the bridge into balance and position the resonant circuit to coincide with the control dial setting.

(e) Rectifiers CR-801 and CR-802 in the input circuit to the servo amplifier limit the input voltage. Because of the non-linear voltage-current characteristic of selenium rectifiers, these circuit elements effectively short-circuit excessive input voltages which might otherwise damage the input transformer.

(f) The servo power supply (see figure 252) provides an a-c voltage to the plates of the servo amplifier. Transformer T-901 in this supply has three windings: The first winding supplies filament voltage to the servo tubes. The second winding supplies 100 volts to operate the bridge circuit. The third winding supplies 350 volts ac to the plates of the amplifier tubes and to the plates of the push-pull relay control stage through the relay coils. Transformer T-902 has one tapped winding which supplies voltage to operate the drive motors.

(2) *Metering and monitoring provisions.* Provisions are made for metering the cathode current of all r-f tubes in the equipment. Eight permanently-mounted diode voltmeters are also included in the equipment for use in measuring the peak r-f voltages. These meters are a valuable aid in tuning the equipment, as well as in setting it up for single-sideband operation.

(a) A continuous check of the total cathode current of the intermediate power amplifier, the cathode current of the driver, the cathode current of the power amplifier and the total grid current of the power amplifiers is maintained by M-502, M-501, M-1501, and M-1503, respectively. Meters M-501 and M-502 are 0-500 ma and 0-8 amp meters, respectively, and are located on the upper front door of Radio Transmitter T-454/FRT-26. Meters M-1501 and M-1503 are 0-20 and 0-3 amp meters, respectively, and are located on the upper front door of R-F Amplifier AM-738/FRT-22.

(b) Two 0-1 ma meters, M-505 and M-506, are mounted on the upper front door of Radio Transmitter T-454/FRT-26 and are labeled EXCITER TEST NO. 1 and EXCITER TEST NO. 2, respectively. Each of these meters checks five different circuits. The meters are simultaneously switched into the various circuits by means of a single switch, S-503. The meters have arbitrary scales with full-scale reading for each position of the switch indicated opposite the switch pointer. EXCITER TEST NO. 1, M-505, checks the buffer-amplifier cathode current, the first multiplier cathode current, the second multiplier current, and the peak r-f voltages in the grid circuit of the right intermediate power amplifier and the left intermediate power amplifier. EXCITER TEST NO. 2, M-506, checks the combined buffer and first multiplier grid current, the grid current of the second multiplier, the grid current of the driver, and the peak r-f voltages in the plate circuits of the right intermediate power amplifier and the left intermediate power amplifier.

(c) The meter designated PA TEST, M-507, is a 0-1 ma meter mounted on the upper front door of Radio Transmitter T-454/FRT-26, and provides, through the setting of selector switch S-504, metering of the individual cathode and grid currents of the intermediate power amplifier tubes, as well as the total grid current of the same stage. M-507 has arbitrary scales, the proper full scale reading for the various circuits indicated opposite the pointer on selector switch S-504.

(d) The meter designated PA TEST, M-1502, located on the upper front door of R-F Amplifier AM-738/FRT-22, is an 0-1 ma meter with arbitrary scales. It meters the individual cathode currents of all six power amplifier tubes as well as the right and left power amplifier total grid current. It is switched into the various circuits by selector switch S-1501, marked PA TEST. The switch also indicates the full scale value of the meter for the circuit being metered.

(e) M-1504 is an 0-1 ma meter which measures the peak r-f voltage of both the grid and plate circuits of the right and left power amplifiers. It has arbitrary scales as indicated opposite the pointer of selector switch S-1502.

(f) Antenna current is metered by M-1505 and M-1506, which are located on top of R-F Amplifier AM-738/FRT-22. These meters have switches which allow them to be inserted or shunted out of the lines.

(g) A sample of the r-f voltage applied to the grid of the first buffer, which is between 2000 and 4000 kc, is fed to an external frequency monitoring circuit through coaxial jacks and plugs J-503, P-503, J-506 and P-506.

55. Preset Tuning Control Circuits

The preset tuning control circuits of Radio Transmitting Set AN/FRT-22 are located on and behind the preset tuning control panels of Radio Transmitter T-454/FRT-26 and R-F Amplifier AM-738/FRT-22, respectively. The tuning control circuits consist basically of 10 sets of tuning controls and a switching system which selects one set of tuning controls for each r-f unit according to the setting of the channel selector switch. Each set of tuning controls on Radio Transmitter T-454/FRT-26 includes six servo-control potentiometers (1st mult. plate, 2nd mult. plate, driver plate, IPA plate, IPA coupling, and coupling-network tuning) and the coupling-network shorting switch. Each set of tuning controls on R-F Amplifier AM-738/FRT-22 includes three servo-control potentiometers (PA plate tuning, antenna coupling, and antenna tuning), the PA input-capacity switch, and the PA plate tank shorting switch.

a. Theory, General.

(1) The Channel selector switch is located on the front of the IPA preset tuning control panel. Operation of this switch energizes the IPA channel-selecting autopositioner. This autopositioner rotates a multi-section, multi-position selector switch, and the setting of the switch determines which set of controls is placed in the IPA tuning circuits.

(2) One of the switch sections of the autopositioner-driven IPA channel-selecting switch controls the PA channel-selecting autopositioner. The PA channel-selecting autopositioner rotates another multi-section, multi-position selector switch. This switch determines which set of controls is placed in the PA tuning circuits.

(3) In the IPA bay, six servo-control potentiometers are switched into the servo-amplifier input circuits for each channel. Subsequently, the servo system operates to position the corresponding tuned circuits according to the settings of the control potentiometers. One coupling-network shorting control switch is placed in the control circuit to the coupling-network shorting-switch drive unit. The drive unit operates

to position the coupling-network shorting switch according to the setting of the control switch. In addition, one section of the autopositioner-driven IPA channel-selecting switch selects the position upon which the 40H oscillator crystal-selecting autopositioner is to set up. The crystal-selector switch sets up on a position corresponding to the channel selected.

(4) In the PA bay, three servo-control potentiometers are switched into the servo-amplifier input circuits for each channel. Subsequently, the servo system operates to position the corresponding tuned circuits according to the settings of the control potentiometers. One input-capacity control switch is placed in the control circuit to the input-capacity drive unit. The drive unit operates to position the input capacitors according to the setting of the control switch. One PA tank shorting control switch is placed in the control circuit to the PA tank shorting-switch drive unit. Subsequently, the drive unit operates to position the PA tank shorting switch according to the setting of the control switch.

(5) Functions of the preset tuning control circuits as outlined in the previous paragraphs are complicated by two requirements: First, transmitter excitation must be removed during the interval that any of the tuning control circuits is operating, and must be returned only after each of the control circuits has positioned its tuning element. Second, the servo tuning system must include provisions for preventing tuning error due to non-uniformity of overtravel of the servo drive units. This second requirement is fulfilled in each r-f unit tuning system by a circuit which "prepositions" the servo drive units before allowing the units to set up at the final positions. In the prepositioning process, the entire servo amplifier bridge circuit is first unbalanced so that the servo drive units set up at positions equally offset from the final positions. Then, when all of the servo drive units have stopped, each at its offset position, balance is restored to the servo amplifier bridge circuit. The servo drive motors then run, all in the same direction, and each for the same interval, to position the tuned circuits according to the settings of the servo-control potentiometers. Thus it is assured that each servo drive unit will set up at exactly the same position each time a given channel is selected.

(6) Paragraphs b. and c. following contain step-by-step analyses of the preset tuning sequence of events for the IPA unit and PA unit, respectively. These analyses assume a thorough understanding of the theory of servo tuning (refer to par. 54 d. (1) (a) through 54 d. (1) (f).

(7) Figures 118 and 119 are simplified schematic diagrams of the IPA and PA preset tuning circuits, respectively. In these diagrams, the only components represented are those which are essential to operation of the preset tuning circuits. Minor components (spark-suppressing capacitors, fuses, blown-fuse indicators, etc.) are not included.

(8) One set of servo-control potentiometers is shown. Potentiometers for the other channels are connected in similar circuits; the set in use is determined by the position of autopositioner-driven channel-selecting switches S-711 and S-712, respectively. In each diagram, only one servo amplifier and one servo drive unit is shown. The amplifiers and drive units shown are connected in circuits similar to, but not necessarily identical to, those of the other servo amplifiers and drive units.

(9) Paragraphs b. and c. following are essentially elaborations of the preset tuning flow charts (figs. 120 and 121). Both these flow charts and the preset tuning control circuit simplified diagrams may be of value in gaining an understanding of the preset tuning system.

b. IPA Preset Tuning Sequence of Operation. In the following discussion, and in the discussion of the PA preset tuning sequence of operation, steps in the main sequence of events are identified by numbers in parentheses ((1), (2), (3), etc.). Secondary sequences arising from main steps are identified by lower-case letters in parentheses ((a), (b), (c), etc.). Tertiary sequences arising from secondary steps are identified by numbers (1., 2., 3., etc.).

(1) Manual channel-selector switch S-524 is operated, and is set on the desired channel number.

(a) Operation of S-524 energizes tuning-voltage control relay K-501.

1. Normally-closed contacts on K-501 are in series with the circuit which supplies voltages to the servo-control potentiometers and the motor-driven servo potentiometers.

2. Therefore, when K-501 operates, tuning voltage is removed, and the servo sys-

tem is disabled. The servo system is held disabled until the IPA motor-driven channel-selecting switch S-711 has stopped at the position corresponding to the channel selected.

(b) Operation of K-501 also energizes sequence-starting slow-release relay K-502.

(c) Operation of K-502 energizes prepositioning-voltage relay K-505 through normally-closed contacts of servo sequence-control slow-release relay K-503.

1. In the normal position of K-505, R-628 is in series with the circuit which supplies voltage to the servo-control potentiometers, and R-627, in the other leg of this circuit, is shorted.

2. Therefore, when K-505 operates, R-628 is shorted, and R-627 is inserted in series with the servo-control voltage circuit. Thus, all of the resistances in the servo-control circuit are unbalanced by 47 ohms, so that when tuning voltage is re-applied to the servo-control potentiometers, the servo drive units will set up at their offset positions (points corresponding to a frequency slightly lower than channel frequency).

(d) Operation of K-505 also energizes excitation-release slow-release relay K-504. Normally-open contacts on K-504 are in series with a circuit which applies a blocking voltage to the buffer and first multiplier grid circuits. Therefore, when K-504 operates, excitation is removed within the r-f circuits of the transmitter. K-504 will be held closed by various interlocking circuits until every tuning element has been positioned in accordance with the settings of the servo control potentiometers, shorting switch, etc. K-504 is a slow-release relay so that momentary interruptions of the holding circuit do not return transmitter excitation.

Note. The operation of K-504 de-energizes excitation-control relay K-509. When EXCITATION CONTROL switch S-527 is in 1-SWR of SSB position, the release of K-509 causes the release of main breaker K-401 by de-energizing undervoltage-release coil K-401B. The circuit to main breaker motor K-401 is also held open so that the main breaker does not close until the release of K-504 causes K-509 to operate. This circuit is provided so that high voltage is removed from the equipment whenever the transmitter is channeling in SSB operation.

(e) Note that the operation of K-505 has also prepared a holding circuit through normally-open contacts of sequence-control slow-release relay K-503.

(2) Simultaneously with main step (1) previous, main step (2) occurs. The operation of manual channel-selector switch S-524 energizes channel-selecting autopositioner relay K-701.

(3) Operation of K-701 starts channel-selecting autopositioner motor B-703. Note that the operation of K-701 also removes voltage from antenna-network shorting-switch drive unit motor B-503: Thus, the antenna-network shorting-switch drive unit cannot operate until the channel-selecting autopositioner has completed its function and K-701 has released.

(4) B-703 rotates motor-driven channel-selector switch S-711. Note that switch section S-711B is the PA unit channel-selecting autopositioner control switch. The rotation of S-711 thus initiates the tuning cycle in the PA unit, as described in paragraph c. following.

(5) S-711 is driven to a position corresponding to the channel selected.

(a) When switch section S-711A is in the same position as manual channel-selector switch S-524, the energizing circuit to autopositioner relay K-701 is broken.

1. Antenna-network shorting-switch drive unit motor B-503, when energized by the operation of antenna-network control relay K-506, receives its energizing voltage through normally-closed contacts of K-701.

2. Therefore, the release of K-701 allows the operation of B-503.

(b) The release of K-701 de-energizes autopositioner motor B-703.

(6) When switch section S-711A is in the same position as manual channel-selector switch S-524, the energizing circuit to tuning-voltage control relay K-501 is also broken.

(a) If antenna-network shorting control switch S-525 is not in a position corresponding to the setting of antenna-network shorting-switch drive-unit seeking switch S-526, the release of K-501 applies an energizing

voltage through S-711M, S-525, and S-526 to non-servo sequence control relay K-507.

(b) Operation of K-507 energizes antenna-network control relay K-506. Note that operation of K-507 also completes a holding circuit to excitation-release slow-release relay K-504 through normally-closed contacts of K-501 so that K-504 cannot release to return transmitter excitation until K-507 has released.

(c) Operation of K-506 energizes antenna-network shorting-switch drive-unit motor B-503 through normally-closed contacts on K-701.

(d) B-503 drives antenna-network shorting-switch drive-unit seeking switch S-526 to a position corresponding to the position of antenna-network shorting control switch S-525.

1. When S-525 and S-526 are in the same position, the circuit to the coil of antenna-network control relay K-506 is broken, and K-506 releases.

2. The release of K-506 de-energizes antenna-network shorting-switch drive-unit motor B-503.

(e) When S-525 and S-526 are in the same position, the circuit to the coil of non-servo sequence control relay K-507 is also broken.

(f) The release of K-507 energizes crystal-selector autopositioner relay K-1101 through normally-closed contacts on K-501, through crystal-selector control switch S-711N, and through crystal-selector seeking switch S-1104.

Note. The circuit described in the preceding step (f) was completed earlier in step a.(6)(a), but only for an instant, because the release of K-501 also energized K-507 at that time, and the operation of K-507 immediately de-energized K-1101. Had the antenna network shorting switch been in a position corresponding to the setting of the antenna-network shorting control switch, however, K-507 would not have been energized, and the crystal-selector autopositioner relay, K-1101, would have been energized immediately upon the release of K-501, as in step (g) following.

Note. As K-507 releases, contacts 2 open before contacts 1 open. This feature insures that the holding circuit to excitation-release slow-release relay K-504 will be maintained until K-1101 is energized. When K-1101 is energized, the holding circuit to K-504 is completed through CR-502. This rectifier is used to prevent the holding-circuit voltage on K-504 from prematurely operating K-1101, but to allow the energizing voltage on K-1101 to hold K-504 in the event that the crystal-selecting autopositioner is the last tuning element to cycle. That is, the rectifier allows the voltage on K-1101 to hold in K-504, but prevents the voltage on K-504 from operating K-1101.

(g) The operation of K-1101 energizes crystal-selector autopositioner motor B-1101.

(h) B-1101 drives crystal-selector seeking switch S-1104 to a position corresponding to the setting of crystal-selector control switch S-711N.

(i) When S-1104 is in the same position as S-711N, autopositioner relay K-1101 is de-energized.

(j) The release of K-1101 de-energizes the crystal-selector autopositioner motor B-1101.

(7) The release of K-501 de-energizes sequence-starting slow-release relay K-502. K-502 does not drop out immediately, however, but maintains the holding circuit to prepositioning-voltage relay K-505 until step (9) is completed.

(8) The release of K-501 also applies a voltage to the servo-control potentiometers.

(9) The servo system operates to energize the servo motors (shown as B-701).

(a) From the field (1-3) winding of each servo motor are two one-megohm resistors (shown as R-641 and R-642) connected to a common line, which line is in turn coupled to the grid of thyratron V-508. V-508 is biased through R-625 with a-c filament voltage so that the thyratron does not fire until one or more of the servo drive units is energized.

(b) Application of an energizing voltage to the servo motors, therefore, fires thyratron V-508.

(c) Conduction of V-508 energizes servo-sequence control slow-release relay K-503. K-503 is a slow-release relay for

two reasons: First, since it is energized by a pulsating d-c current, the slow-release feature prevents chattering. Second, since operation of the servo motor-control relays sometimes is erratic, the slow-release feature of K-503 prevents the relay from following immediately the action of the servo relays.

(d) Operation of K-503 completes a holding circuit to prepositioning-voltage relay K-505 through holding contacts of K-505. Contact 1 makes before contact 2 breaks so that the circuit through contacts of sequence-starting slow-release relay K-502 to K-505 is maintained while K-503 is closing. A short time after K-503 has operated to maintain the holding circuit to K-505, sequence-starting slow-release relay K-502 releases. Note that the operation of K-503 completes a holding circuit to excitation-release slow-release relay K-504, preventing the return of transmitter excitation until K-503 has released.

(10) The servo motors run until each has stopped at its offset position.

(11) When all of the servo motors are de-energized, the loss of firing voltage to the grid of V-508 causes the tube to cease conducting.

(12) Loss of conduction through V-508 de-energizes servo-sequence control slow-release relay K-503.

(13) Release of K-503 opens the holding circuit to prepositioning-voltage relay K-505.

(14) Release of K-505 restores balance to the servo-control potentiometer circuit.

(15) The servo system operates to energize the servo motors.

(a) Application of an energizing voltage to the servo motors fires thyratron V-508.

(b) Conduction of V-508 energizes servo-sequence control slow-release relay K-503. Operation of K-503, however, does not re-energize prepositioning-voltage relay K-505, because K-505 had been held in by self-holding contacts, which were opened in step (14).

(16) The servo motors run until each has stopped at the point corresponding exactly to channel frequency.

(17) When all of the motors are de-energized, the loss of firing voltage to the grid of V-508 causes the tube to cease conducting.

(18) Loss of conduction through V-508 de-energizes servo-sequence control slow-release relay K-503.

(19) If excitation-release relay K-1505 in the PA unit has released at the completion of the PA tuning cycle, and if the crystal-selecting autopositioner relay K-1101 is de-energized, then the release of servo-sequence control slow-release relay K-503 de-energizes excitation-release slow-release relay K-504.

(20) The release of K-504 returns transmitter excitation, completing the IPA preset tuning cycle.

c. PA Preset Tuning Sequence of Operation.

(1) Motor-driven channel-selector switch S-711B is rotated during operation of the IPA preset tuning circuits (refer to par. 55b.(4)).

(a) Operation of S-711B energizes tuning-voltage control relay K-1506.

1. Normally-closed contacts on K-1506 are in series with the circuit which supplies voltage to the servo-control potentiometers and the motor-driven servo potentiometers.

2. Therefore, when K-1506 operates, tuning voltage is removed, and the servo system is disabled. The servo system is held disabled until the PA motor-driven channel-selecting switch S-712 has stopped at the position corresponding to the channel on which the IPA motor-driven channel-selecting switch S-711 stops.

(b) Operation of K-1506 also energizes sequence-starting slow-release relay K-1508.

(c) Operation of K-1508 energizes prepositioning-voltage relay K-1504 through normally-closed contacts of servo sequence-control relay K-1507.

1. In the normal position of K-1504, R-1563 is in series with the circuit which supplies voltage to the servo-control potentiometers, and R-1564, in the other leg of this circuit, is shorted.

2. Therefore, when K-1504 operates, R-1563 is shorted, and R-1564 is inserted in series with the servo-control voltage circuit. Thus, all of the resistances in

the servo-control circuit are unbalanced by 47 ohms, so that when tuning voltage is re-applied to the servo-control potentiometers, the servo drive units will set up at their offset positions (points corresponding to a frequency slightly lower than channel frequency).

(d) Operation of K-1504 also energizes excitation-release slow-release relay K-1505. Normally-open contacts on K-1505 are in series with an energizing circuit for the IPA excitation-release slow-release relay, K-504. Therefore, when K-1505 operates, K-504 operates to remove transmitter excitation (refer to par. 55.b.(1)(d)). K-1505 will be held closed by various interlocking circuits until every tuning element in the PA bay has been positioned in accordance with the settings of the servo-control potentiometers, the PA input capacity switch, and the PA tank shorting switch. K-1505 is a slow-release relay so that momentary interruptions of the holding circuit do not open the relay contacts.

(e) Note that the operation of K-1504 has also prepared a holding circuit through normally-open contacts of sequence-control slow-release relay K-1507.

(2) Simultaneously with step (1) previous, step (2) occurs. The rotation of S-711B energizes channel-selecting autopositioner relay K-702.

(3) Operation of K-702 starts channel-selecting autopositioner motor B-704. Note that the operation of K-702 also removes voltage from the plate tank shorting switch drive motor circuit and input-capacity tuning motor circuit. Thus, the plate tank shorting switch drive unit and input capacity drive unit cannot operate until the channel-selecting autopositioner has completed its function and K-702 has released.

(4) B-704 rotates motor-driven channel-selector switch S-712.

(5) S-712 is driven to a position corresponding to the channel selected.

(a) When switch section S-712A is in the same position as S-711B, the energizing circuit to autopositioner relay K-702 is broken.

1. The release of K-702 applies voltage to the plate tank switch drive motor circuit and input-capacity tuning motor circuit. Neither motor can run, however, until holding relay K-1503 is energized.

2. The release of K-702 energizes K-1503 if input-capacity open-seeking switch S-1523 is not in a position corresponding to the setting of input-capacity control switch S-1525. This circuit is completed from K-702 through S-1525, through input-capacity channel selector switch sections S-712G, S-712H, S-712J, and S-712K, through S-1523, and through rectifier CR-1503.

Note. Holding relay K-1503 may be energized either by the release of K-702 or by the operation of K-1502. In subsequent discussion, the conditions for the operation of K-1502 will be assumed, after which the functions of K-503 will be described (step (6) (b) following).

(b) The release of K-702 de-energizes autopositioner motor B-704.

(6) When switch section S-712A is in the same position as S-711, the energizing circuit to tuning-voltage control relay K-1506 is also broken.

(a) If plate tank shorting seeking switch S-1524 is not in a position corresponding to the setting of plate tank shorting control switch S-1526, the release of K-1506 applies an energizing voltage to PA plate tank shorting motor control relay K-1502. This circuit is completed from K-1506 through S-712M, S-1526, and S-1524.

Note. The operation of K-1502 applies a voltage to plate tank shorting motor B-1505, but B-1505 cannot operate until K-1503 is energized to complete the motor circuit.

(b) The operation of K-1502 energizes holding relay K-1503 through rectifier CR-1502. Note that K-1503 may be energized by the release of K-702 (step (5) (a) (2). preceding) or by the operation of K-1502. Neither of the two energizing circuits can act upon the other, however, because rectifiers CR-1502 and CR-1503 allow only unidirectional current flow.

Note. K-1503 is a slow-release relay so that pulsations in coil current caused by rectification of the a-c supply voltage do not cause K-1503 to chatter. As K-1503 operates, contacts 1 close first to insure that the circuit to the excitation-release

slow-release relay, K-1505, is completed before either B-1504 or B-1505 can be energized. When contacts 2 close, the energizing circuit to both motors is completed. When either of the motors is running, the completion of its open-seeking circuit maintains the energizing voltage to its motor and to K-1503, so that K-1503 is held closed until both seeking-switch circuits are open. Since the operation of plate tank motor control relay K-1502 was assumed, in a secondary sequence, the subsequent operation of plate tank shorting motor B-1505 will be assumed as a secondary sequence in step (6) (c). The operation of B-1504, however, which is dependent upon input-capacity seeking switch S-1523 being in a different position from input-capacity control switch S-1525, will be considered a tertiary sequence in step (6) (b) 1. following. Should this sequence of operations become confusing, refer to the flow chart, figure 121.

1. If input-capacity seeking switch S-1523 is not in a position corresponding to the setting of input-capacity control switch S-1525, the operation of holding relay K-1503 energizes input-capacity tuning motor B-1504. This circuit is completed from autopositioner relay K-702 through S-1525, through input-capacity channel selector switch sections S-712G, S-712H, S-712J, and S-712K, through S-1523, to motor B-1504, and through contacts 2 of holding relay K-1503.

2. B-1504 drives motor-driven seeking switches S-1522 and S-1523 to a position corresponding to the setting of input-capacity control switch S-1525.

   Note. Seeking switch S-1523 makes two revolutions for each revolution of the input capacitors. Therefore, two positions of the input capacitor correspond to each position of the seeking switch. S-1522, however, follows directly the rotation of the input capacitors. This switch is provided to complete the motor circuit whenever the input capacitors have reached the fully open position and to run the motor until the capacitor plates are fully meshed. This provision insures that the seeking circuit can open to de-energize the input-capacity drive motor during only one half of the rotation cycle of the input capacitors.

3. When S-1522 and S-1523 reach the position corresponding to the setting of input-capacity control switch S-1525, input-capacity tuning motor B-1504 is de-energized. This operation also removes voltage from the circuit to holding relay K-1503. K-1503 may or may not now be held energized by voltage from plate tank shorting motor B-1505. In any case, K-1503 will release only when the seeking switch circuits on both motor drive units have opened.

(c) The operation of K-1503 energizes plate tank shorting motor B-1505. This circuit is completed from K-702 through the contacts of K-1502 (assumed closed in step (6) (a) preceding), through motor B-1505, and through contacts 2 of K-1503.

(d) B-1505 drives seeking switch S-1524 to a position corresponding to the setting of plate tank shorting control switch S-1526.

(e) When S-1524 and S-1526 are in the same position, the circuit to the coil of motor control-relay K-1502 is broken.

(f) The release of K-1502 de-energizes plate tank shorting motor B-1505. This operation also removes voltage from the circuit to holding relay K-1503.

(g) If the energizing circuit to K-1503 from B-1504 is broken (step (6) (b) 3. previous), K-1503 releases.

(h) The release of K-1503 opens the holding circuit to excitation-release slow-release relay K-1505. K-1505, however, may still be held in if the servo system has not completed its operation (steps (7) et. seq.).

(7) The release of K-1506 de-energizes sequence-starting slow-release relay K-1508. K-1508 does not drop out immediately, however, but maintains the holding circuit to prepositioning-voltage relay K-1504 until step (9) is completed.

(8) The release of K-1506 also applies a voltage to the servo-control potentiometers.

(9) The servo system operates to energize the servo motors (shown as B-701).

(a) From the field (1-3) winding of each servo motor are two one-megohm resistors (shown as R-1556 and R-1557) connected to a common line, which line is in turn coupled to the grid of thyratron V-1507. V-1507 is biased through R-1562 with a-c filament voltage so that the thyratron does

not fire until one or more of the servo drive units is energized.

(b) Application of an energizing voltage to the servo motors, therefore fires thyratron V-1507.

(c) Conduction of V-1507 energizes servo-sequence control slow-release relay K-1507. K-1507 is a slow release relay for two reasons: First, since it is energized by a pulsating d-c current, the slow-release feature prevents chattering. Second, since operation of the servo motor-control relays is sometimes erratic, the slow-release feature of K-1507 prevents the relay from following immediately the action of the servo relays.

(d) Operation of K-1507 completes a holding circuit to prepositioning-voltage relay K-1504 through holding contacts of K-1504. Contact 1 makes before contact 2 breaks so that the circuit through contacts of sequence-starting slow-release relay K-1508 to K-1504 is maintained while K-1507 is closing. A short time after K-1507 has operated to maintain the holding circuit to K-1504, sequence-starting slow-release relay K-1508 releases. Note that the operation of K-1507 completes a holding circuit to excitation-release slow-release relay K-1505, preventing the return of transmitter excitation until K-1507 has released.

(10) The servo motors run until each has stopped at its offset position.

(11) When all of the servo motors are de-energized, the loss of firing voltage to the grid of V-1507 causes the tube to cease conducting.

(12) Loss of conduction through V-1507 de-energizes servo-sequence control slow-release relay K-1507.

(13) Release of K-1507 opens the holding circuit to prepositioning-voltage relay K-1504.

(14) Release of K-1504 restores balance to the servo-control potentiometer circuit.

(15) The servo system operates to energize the servo motors.

(a) Application of an energizing voltage to the servo motors fires thyratron V-1507.

(b) Conduction of V-1507 energizes servo-sequence control slow-release relay K-1507. Operation of K-1507, however, does not re-energize prepositioning-voltage relay K-1504, because K-1504 had been held in by self-holding contacts, which were opened in step (13).

(16) The servo motors run until each has stopped at the point corresponding exactly to channel frequency.

(17) When all of the servo motors are de-energized, the loss of firing voltage to the grid of V-1507 causes the tube to cease conducting.

(18) Loss of conduction through V-1507 de-energizes servo-sequence control slow-release relay K-1507.

(19) If both seeking-switch circuits in the input-capacity tuning circuit and plate tank shorting circuit have opened to de-energize holding relay K-1503, then the release of servo-sequence control slow-release relay K-1507 de-energizes excitation-release slow-release relay K-1505.

(20) The release of K-1505 allows the release of IPA excitation-release slow-release relay K-504, completing the PA preset tuning cycle.

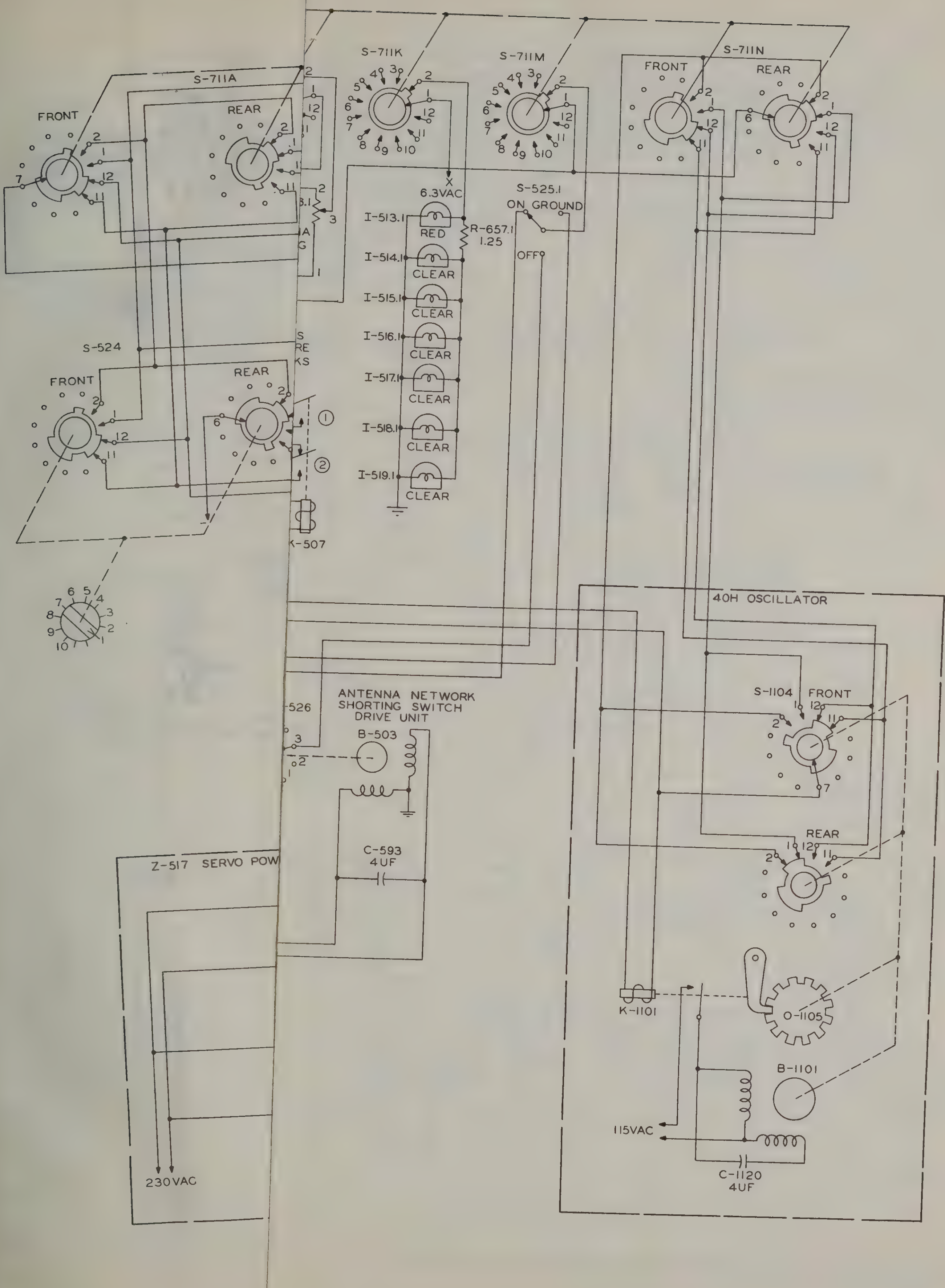
56. Power Supplies

a. General. This portion of Radio Transmitting Set AN/FRT-22 consists of two main power units and a primary voltage regulating system. These units will be explained in detail in the following order.

(1) Primary voltage regulating system (230 volts).
(2) Power Supply Assembly PP-1088/FRT-26.
(3) Power Supply Assembly PP-1089/FRT-22.

b. Primary Voltage Regulating System (fig. 122).

(1) The voltage-regulating circuit in the primary 230-volt system automatically steps the input line voltage up or down by the required amount to maintain a constant output voltage of 230. The secondary of each of three buck-boost transformers, T-311, T-312, and T-313, is in series with one phase of the 230-volt line. If the line voltage increases, an opposing voltage is made to appear across the secondaries of the buck-boost transformers, which reduces the output voltage to 230. Conversely, if the input voltage decreases, an additive voltage is made to appear across the buck-boost transformers, and the output voltage is raised to 230. Three autotransformers on powerstat Z-301 supply voltage to the



S-711K
S-711M
S-711N
FRONT
REAR
S-711A
6.3VAC
S-525.1
ON GROUND
I-513.1
RED
R-657.1
1.25
I-514.1
CLEAR
OFF
I-515.1
I-516.1
I-517.1
I-518.1
I-519.1
S-524
K-507
40H OSCILLATOR
S-1104
ANTENNA NETWORK
SHORTING SWITCH
DRIVE UNIT
B-503
C-593
4UF
Z-517 SERVO POW
K-1101
O-1105
B-1101
115VAC
C-1120
4UF
230VAC

not fire until one or more of the servo drive units is energized.

(b) Application of an energizing voltage to the servo motors, therefore fires thyratron V-1507.

(c) Conduction of V-1507 energizes servo-sequence control slow-release relay K-1507. K-1507 is a slow release relay for two reasons: First, since it is energized by a pulsating d-c current, the slow-release feature prevents chattering. Second, since operation of the servo motor-control relays is sometimes erratic, the slow-release feature of K-1507 prevents the relay from following immediately the action of the servo relays.

(d) Operation of K-1507 completes a holding circuit to prepositioning-voltage relay K-1504 through holding contacts of K-1504. Contact 1 makes before contact 2 breaks so that the circuit through contacts of sequence-starting slow-release relay K-1508 to K-1504 is maintained while K-1507 is closing. A short time after K-1507 has operated to maintain the holding circuit to K-1504, sequence-starting slow-release relay K-1508 releases. Note that the operation of K-1507 completes a holding circuit to excitation-release slow-release relay K-1505, preventing the return of transmitter excitation until K-1507 has released.

(10) The servo motors run until each has stopped at its offset position.

(11) When all of the servo motors are de-energized, the loss of firing voltage to the grid of V-1507 causes the tube to cease conducting.

(12) Loss of conduction through V-1507 de-energizes servo-sequence control slow-release relay K-1507.

(13) Release of K-1507 opens the holding circuit to prepositioning-voltage relay K-1504.

(14) Release of K-1504 restores balance to the servo-control potentiometer circuit.

(15) The servo system operates to energize the servo motors.

(a) Application of an energizing voltage to the servo motors fires thyratron V-1507.

(b) Conduction of V-1507 energizes servo-sequence control slow-release relay K-1507. Operation of K-1507, however, does not re-energize prepositioning-voltage relay K-1504, because K-1504 had been held in by self-holding contacts, which were opened in step (13).

(16) The servo motors run until each has stopped at the point corresponding exactly to channel frequency.

(17) When all of the servo motors are de-energized, the loss of firing voltage to the grid of V-1507 causes the tube to cease conducting.

(18) Loss of conduction through V-1507 de-energizes servo-sequence control slow-release relay K-1507.

(19) If both seeking-switch circuits in the input-capacity tuning circuit and plate tank shorting circuit have opened to de-energize holding relay K-1503, then the release of servo-sequence control slow-release relay K-1507 de-energizes excitation-release slow-release relay K-1505.

(20) The release of K-1505 allows the release of IPA excitation-release slow-release relay K-504, completing the PA preset tuning cycle.

56. Power Supplies

a. General. This portion of Radio Transmitting Set AN/FRT-22 consists of two main power units and a primary voltage regulating system. These units will be explained in detail in the following order.

(1) Primary voltage regulating system (230 volts).
(2) Power Supply Assembly PP-1088/FRT-26.
(3) Power Supply Assembly PP-1089/FRT-22.

b. Primary Voltage Regulating System (fig. 122).

(1) The voltage-regulating circuit in the primary 230-volt system automatically steps the input line voltage up or down by the required amount to maintain a constant output voltage of 230. The secondary of each of three buck-boost transformers, T-311, T-312, and T-313, is in series with one phase of the 230-volt line. If the line voltage increases, an opposing voltage is made to appear across the secondaries of the buck-boost transformers, which reduces the output voltage to 230. Conversely, if the input voltage decreases, an additive voltage is made to appear across the buck-boost transformers, and the output voltage is raised to 230. Three autotransformers on powerstat Z-301 supply voltage to the

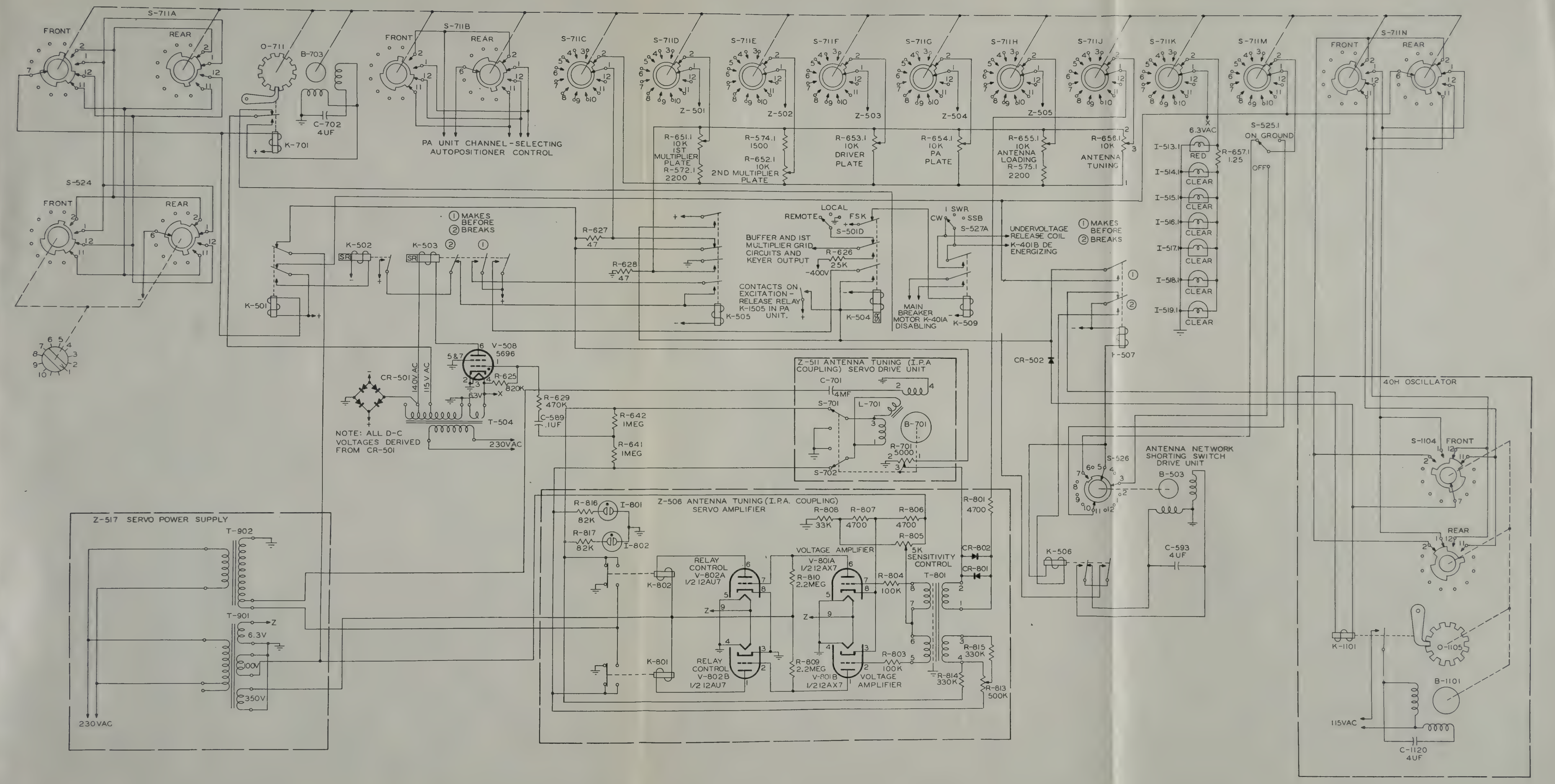
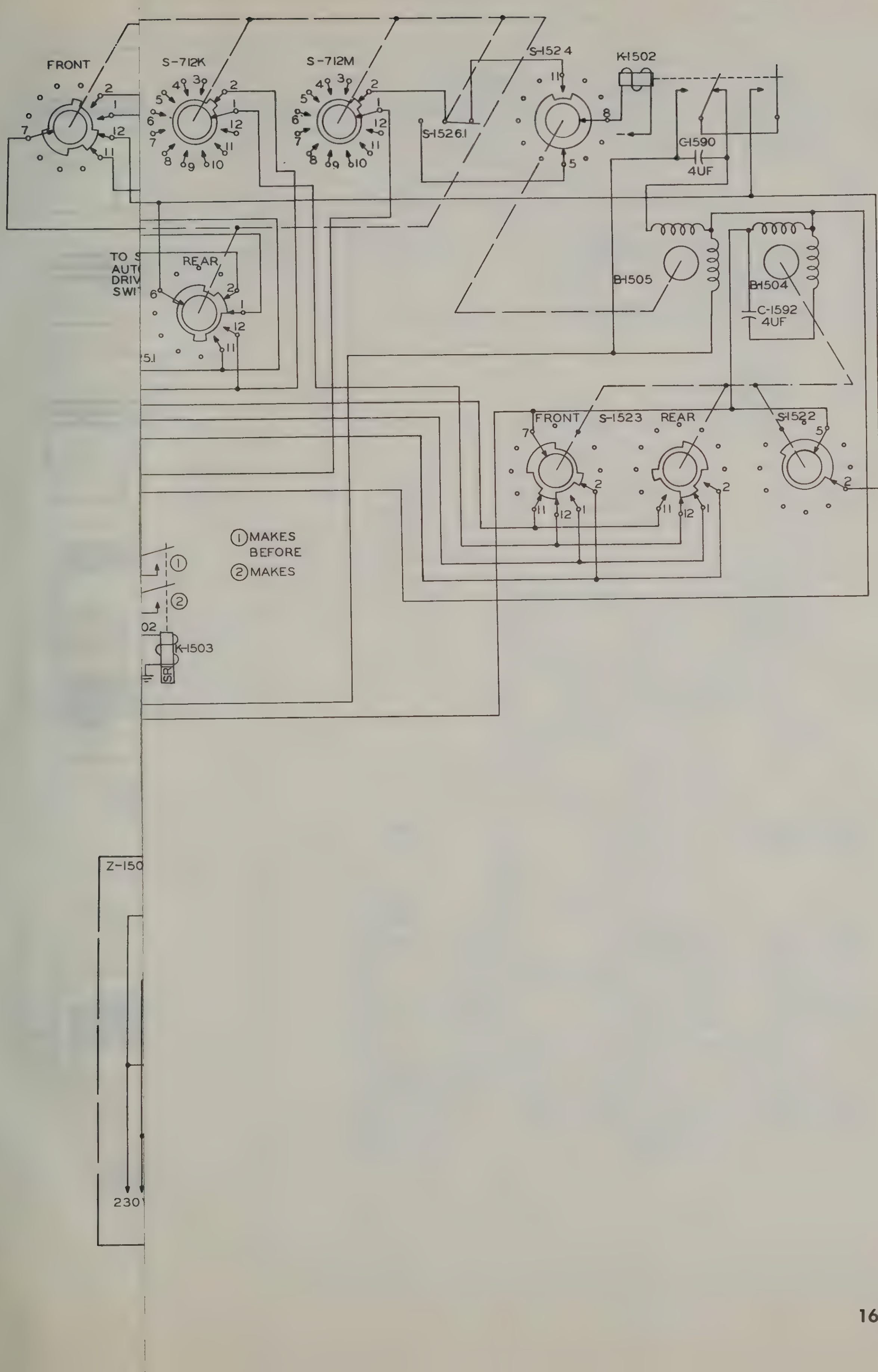


Figure 118. Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Simplified Schematic Diagram.



FRONT
S-712K
S-712M
S-1524
K-1502
S-1526.1
C-1590
4UF
B-1505
B-1504
C-1592
4UF
TO S
AUTO
DRIV
SWIT
REAR
25.1
FRONT
S-1523
REAR
S-1522
①MAKES
BEFORE
②MAKES
02
K-1503
SR
Z-150
230

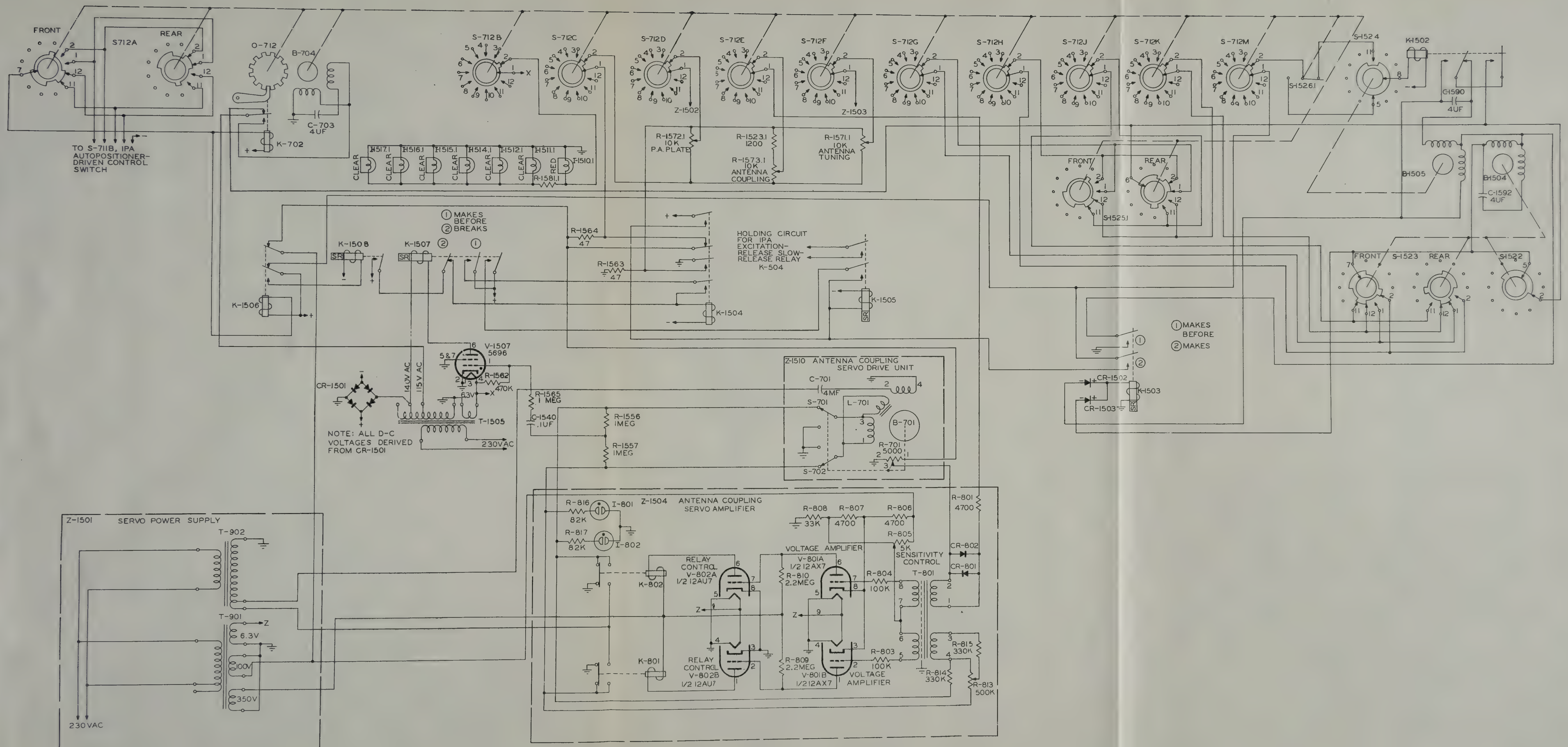
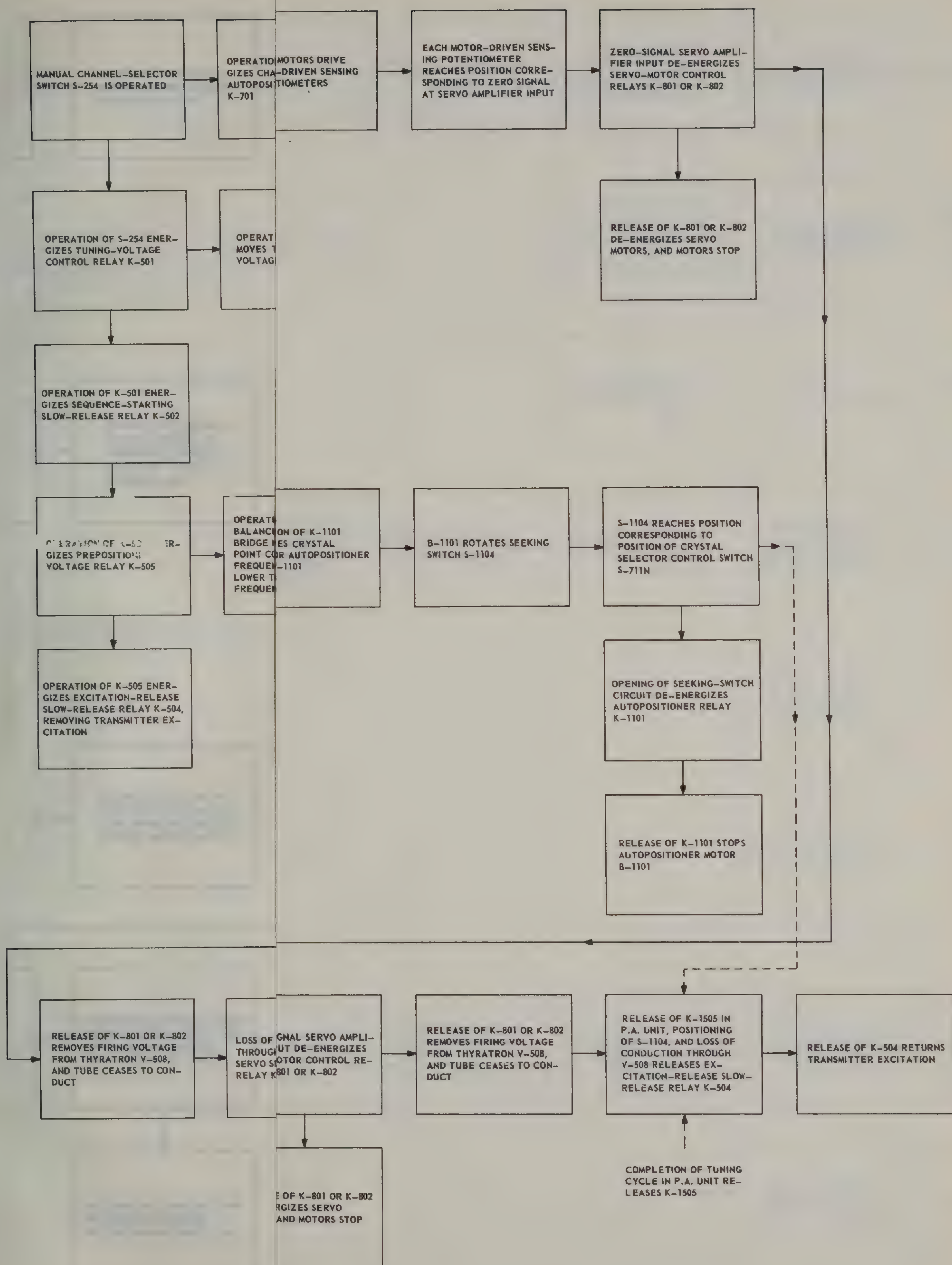


Figure 119. R-F Amplifier AM-738/FRT-22, Preset Tuning Control Circuits, Simplified Schematic Diagram.


MANUAL CHANNEL-SELECTOR SWITCH S-254 IS OPERATED
OPERATIO MOTORS DRIVE GIZES CHA-DRIVEN SENSING AUTOPOSI TIOMETERS K-701
EACH MOTOR-DRIVEN SENSING POTENTIOMETER REACHES POSITION CORRESPONDING TO ZERO SIGNAL AT SERVO AMPLIFIER INPUT
ZERO-SIGNAL SERVO AMPLIFIER INPUT DE-ENERGIZES SERVO-MOTOR CONTROL RELAYS K-801 OR K-802
RELEASE OF K-801 OR K-802 DE-ENERGIZES SERVO MOTORS, AND MOTORS STOP
OPERATION OF S-254 ENERGIZES TUNING-VOLTAGE CONTROL RELAY K-501
OPERAT MOVES T VOLTAG
OPERATION OF K-501 ENERGIZES SEQUENCE-STARTING SLOW-RELEASE RELAY K-502
GIZES PREPOSITION VOLTAGE RELAY K-505
OPERAT BALANC ON OF K-1101 BRIDGE ES CRYSTAL POINT C OR AUTOPOSITIONER FREQUE -1101 LOWER T FREQUE
B-1101 ROTATES SEEKING SWITCH S-1104
S-1104 REACHES POSITION CORRESPONDING TO POSITION OF CRYSTAL SELECTOR CONTROL SWITCH S-711N
OPERATION OF K-505 ENERGIZES EXCITATION-RELEASE SLOW-RELEASE RELAY K-504, REMOVING TRANSMITTER EXCITATION
OPENING OF SEEKING-SWITCH CIRCUIT DE-ENERGIZES AUTOPOSITIONER RELAY K-1101
RELEASE OF K-1101 STOPS AUTOPOSITIONER MOTOR B-1101
RELEASE OF K-801 OR K-802 REMOVES FIRING VOLTAGE FROM THYRATRON V-508, AND TUBE CEASES TO CONDUCT
LOSS OF GNAL SERVO AMPLI- THROUG UT DE-ENERGIZES SERVO S OTOR CONTROL RE- RELAY K 801 OR K-802
RELEASE OF K-801 OR K-802 REMOVES FIRING VOLTAGE FROM THYRATRON V-508, AND TUBE CEASES TO CONDUCT
RELEASE OF K-1505 IN P.A. UNIT, POSITIONING OF S-1104, AND LOSS OF CONDUCTION THROUGH V-508 RELEASES EXCITATION-RELEASE SLOW-RELEASE RELAY K-504
RELEASE OF K-504 RETURNS TRANSMITTER EXCITATION
E OF K-801 OR K-802 RGIZES SERVO AND MOTORS STOP
COMPLETION OF TUNING CYCLE IN P.A. UNIT RELEASES K-1505

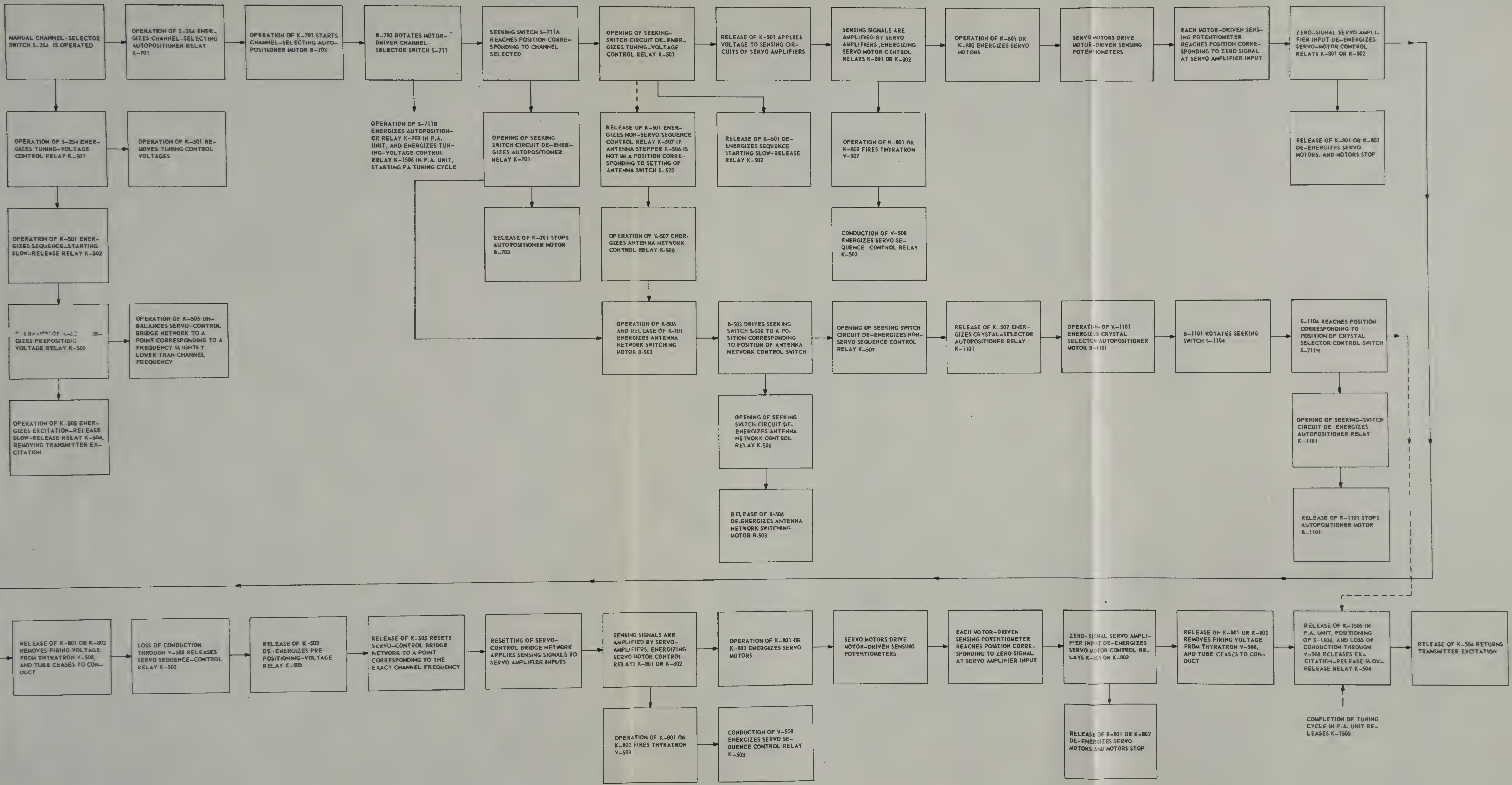
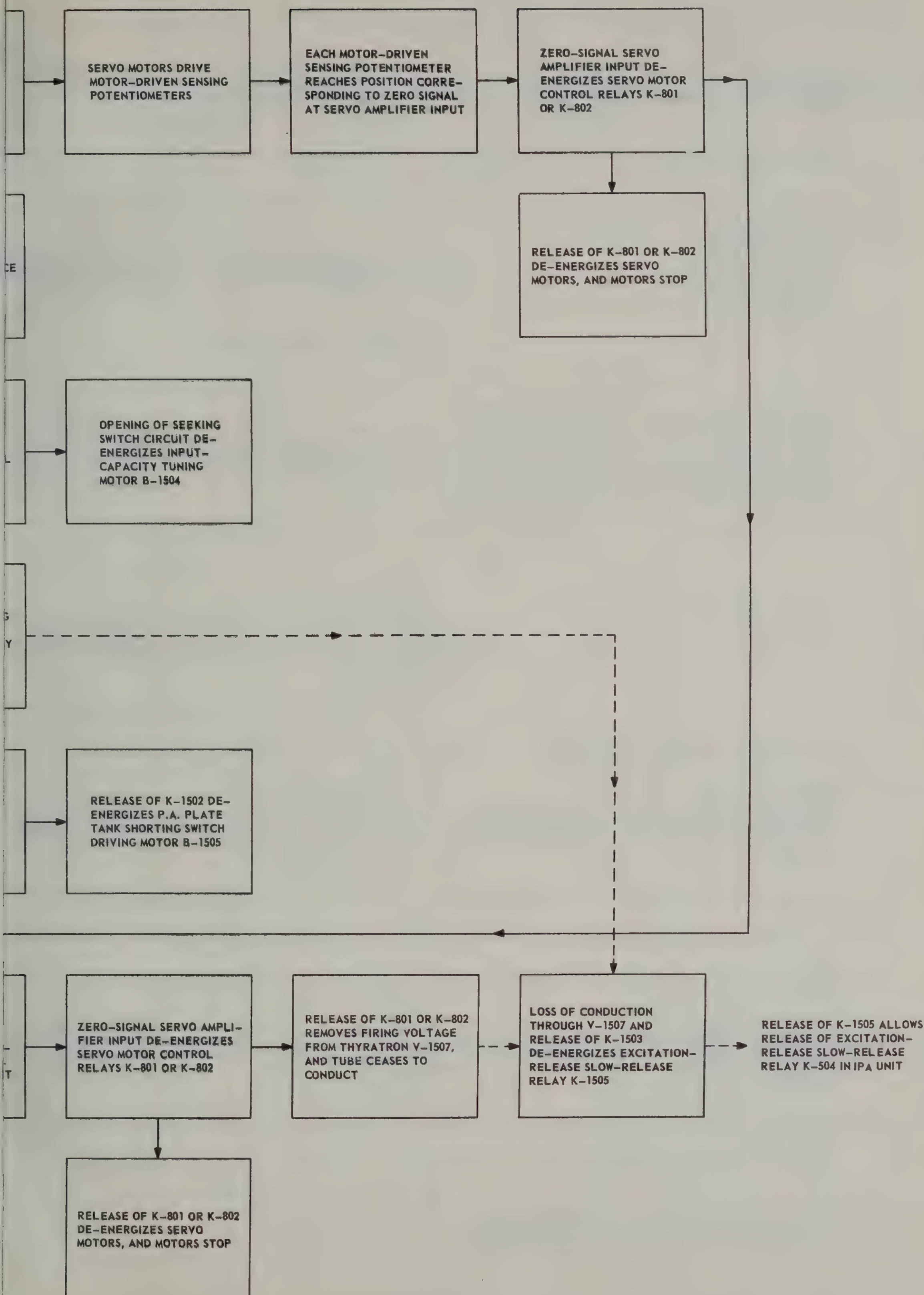


Figure 120. Radio Transmitter T-454/FRT-26, Preset Tuning Control Sequence of Operation, Block Diagram.


SERVO MOTORS DRIVE MOTOR-DRIVEN SENSING POTENTIOMETERS
EACH MOTOR-DRIVEN SENSING POTENTIOMETER REACHES POSITION CORRESPONDING TO ZERO SIGNAL AT SERVO AMPLIFIER INPUT
ZERO-SIGNAL SERVO AMPLIFIER INPUT DE-ENERGIZES SERVO MOTOR CONTROL RELAYS K-801 OR K-802
RELEASE OF K-801 OR K-802 DE-ENERGIZES SERVO MOTORS, AND MOTORS STOP
OPENING OF SEEKING SWITCH CIRCUIT DE-ENERGIZES INPUT-CAPACITY TUNING MOTOR B-1504
RELEASE OF K-1502 DE-ENERGIZES P.A. PLATE TANK SHORTING SWITCH DRIVING MOTOR B-1505
ZERO-SIGNAL SERVO AMPLIFIER INPUT DE-ENERGIZES SERVO MOTOR CONTROL RELAYS K-801 OR K-802
RELEASE OF K-801 OR K-802 REMOVES FIRING VOLTAGE FROM THYRATRON V-1507, AND TUBE CEASES TO CONDUCT
LOSS OF CONDUCTION THROUGH V-1507 AND RELEASE OF K-1503 DE-ENERGIZES EXCITATION-RELEASE SLOW-RELEASE RELAY K-1505
RELEASE OF K-1505 ALLOWS RELEASE OF EXCITATION-RELEASE SLOW-RELEASE RELAY K-504 IN IPA UNIT
RELEASE OF K-801 OR K-802 DE-ENERGIZES SERVO MOTORS, AND MOTORS STOP

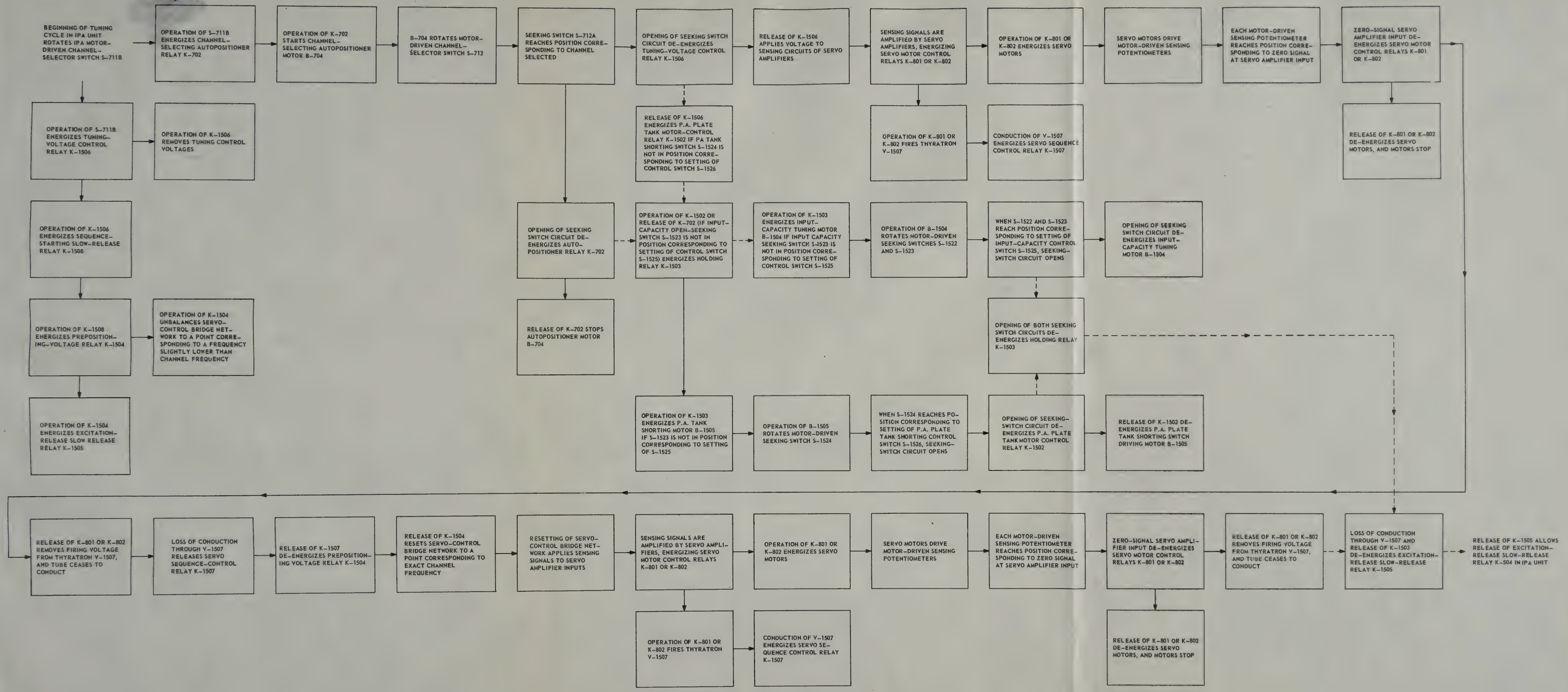


Figure 121. R-F Amplifier AM-738/FRT-22, Preset Tuning Control Sequence of Operation, Block Diagram.

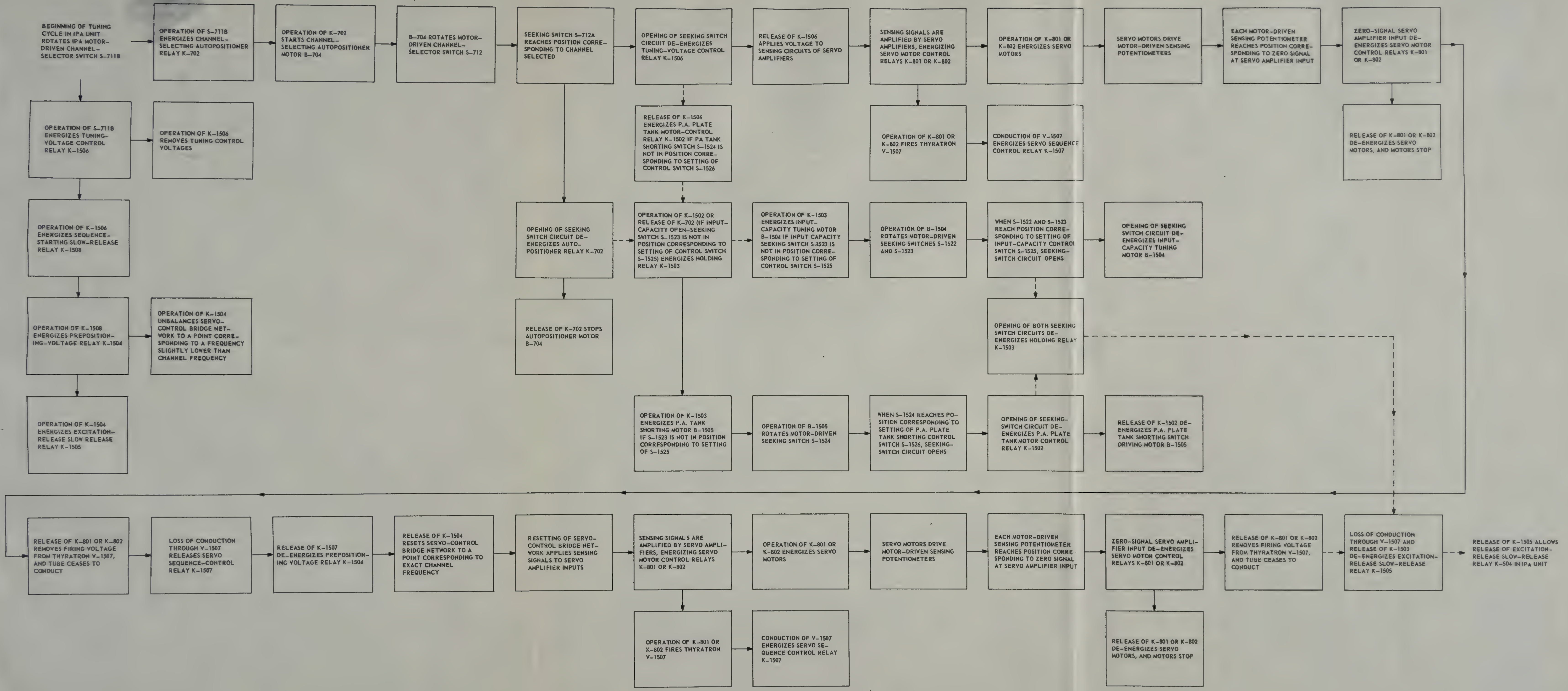


Figure 121. R-F Amplifier AM-738/FRT-22, Preset Tuning Control Sequence of Operation, Block Diagram.

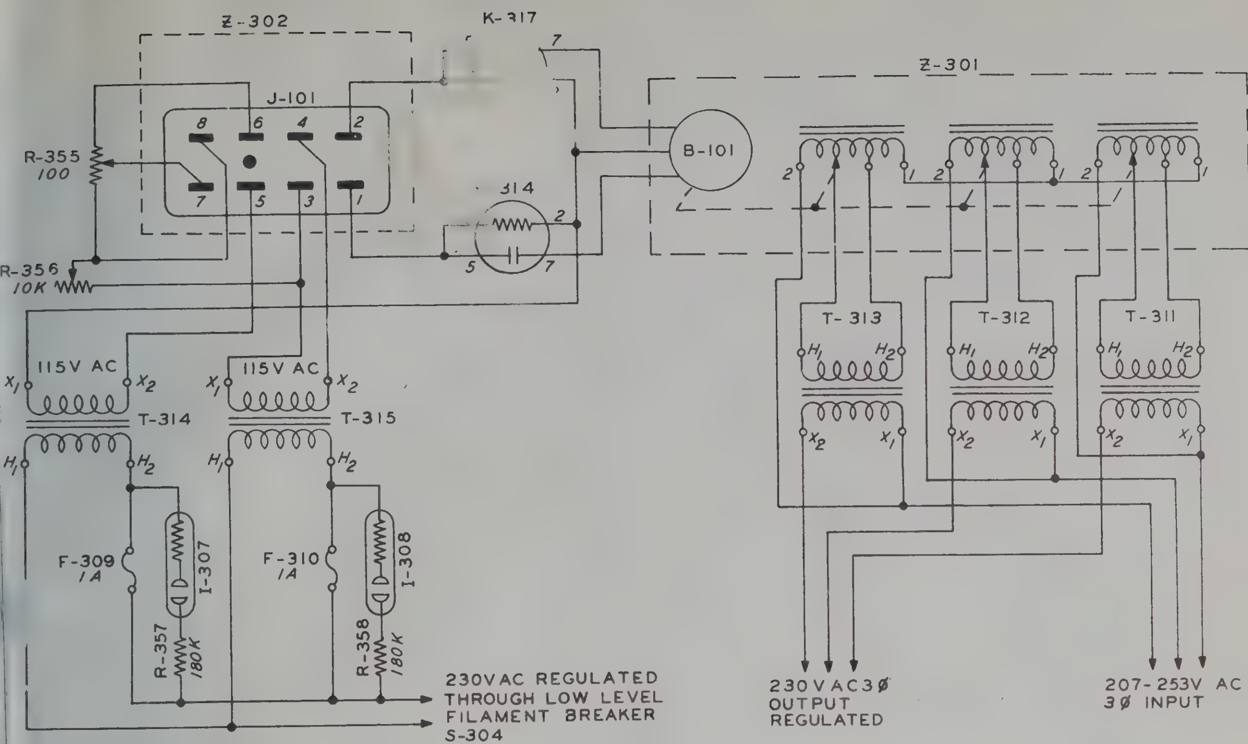


Figure 122. Power Supply Assembly PP-1088/FRT-26, Primary Voltage Regulating Circuit, Schematic Diagram.

primaries of the buck-boost transformers. The primary of each buck-boost transformer is connected to two taps on its respective autotransformer. One of these taps is a slider contact, which may be moved to either side of the stationary tap. Since the autotransformer winding is tied across the input 230-volt line, the magnitude of the voltage appearing across the taps will be a function of the distance between the movable and stationary contacts; and the phase of the voltage will depend upon which side of the stationary contact the slider is positioned. The sliders are positioned by motor B-101, which is in turn controlled by a thyratron voltage-sensing control unit, Z-302 (explained in (2) following). If the output voltage of the regulating system deviates from 230, the thyratron control unit energizes the motor through one of the time-delay relays, K-314, or K-317. After a delay of about 20 seconds, the motor operates to position the taps on the powerstat windings to produce an in-phase or out-of-phase voltage across the windings as required to return the output voltage to 230. When the output voltage of the regulating system is again 230, the thyratron control unit operates to stop powerstat motor B-101. The time delay afforded by K-314 and K-317 prevents the voltage-regulating system from operating on the frequent incremental line voltage changes and transient pulses which may appear in power distribution systems. The regulating system will maintain an output voltage of 230 over a line voltage variation of approximately ±10 percent and a line frequency range of 50 to 60 cps. The voltage-regulating system delivers regulated voltage to all 230-volt primary circuits in the transmitter except the high-voltage plate transformers.

(2) *Thyratron control unit (fig. 123).*

(a) The thyratron control unit is mounted on a sub panel in the power unit with other components of the voltage-regulating system. The control unit plugs into J-101 on the panel and is attached to the panel with two bolts. The unit controls the application of voltage to the powerstat motor according to whether the output voltage of the regulating system rises above or falls below 230. Output from the voltage-regulating system is stepped down by T-315 to 115 volts for operation of the thyratron control unit. The regulated voltage is also stepped down to 115 by T-314 for operation of the powerstat motor, B-101. The two step-down transformers are shown in fig. 122. A-c power for operation of the motor control circuit

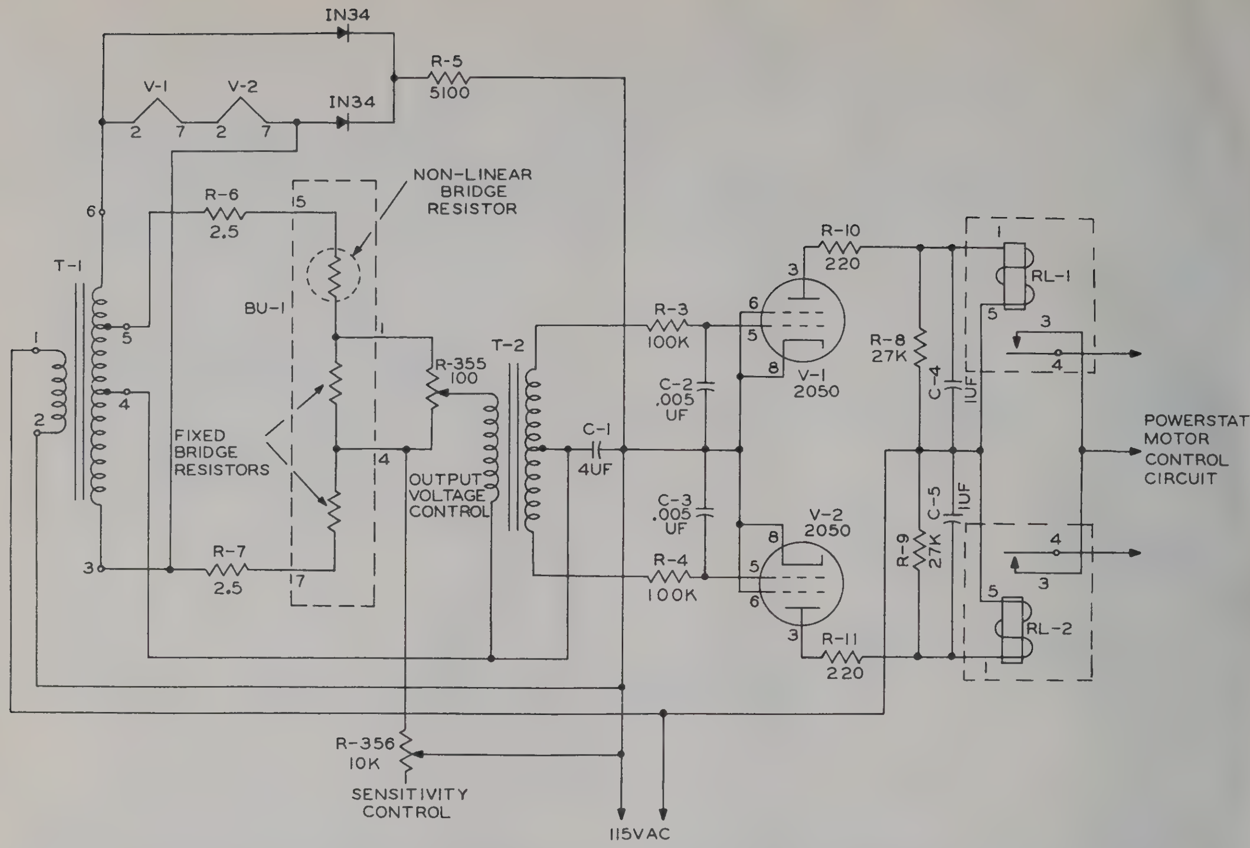


Figure 123. Power Supply Assembly PP-1088/FRT-26, Primary Voltage Regulating Circuit, Thyratron Control Circuit, Schematic Diagram.

is obtained through the low-level filament breaker, S-304, so that the regulating system does not operate until the low-level filaments are energized.

(b) A simplified diagram of the thyratron control unit is shown in fig. 123. Thyratron control tubes V-1 and V-2 operate relays RL-1 and RL-2, respectively, to

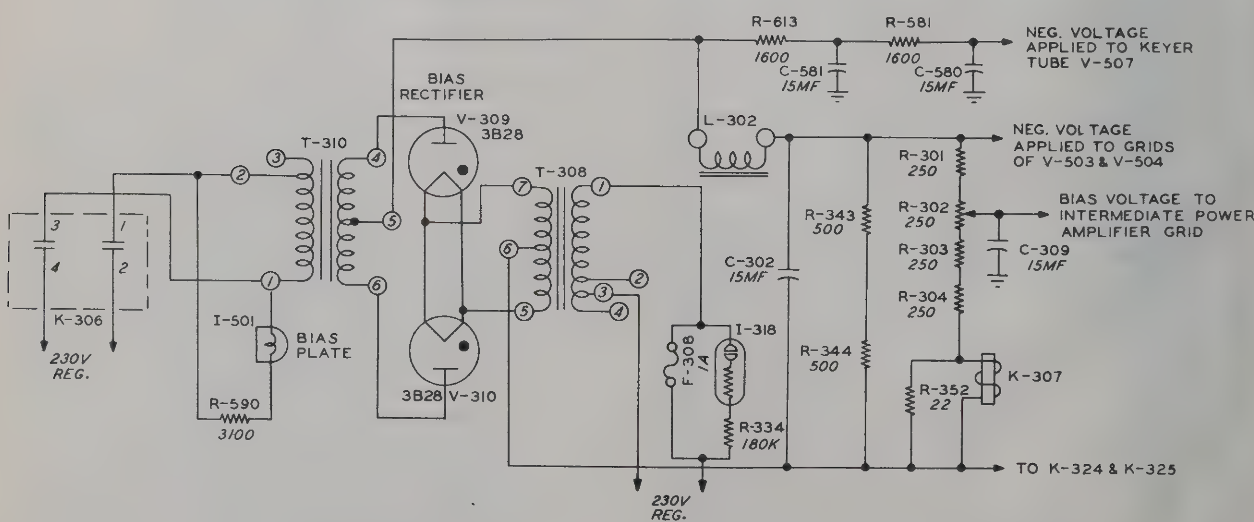


Figure 124. Power Supply Assembly PP-1088/FRT-26, Bias Supply, Schematic Diagram.

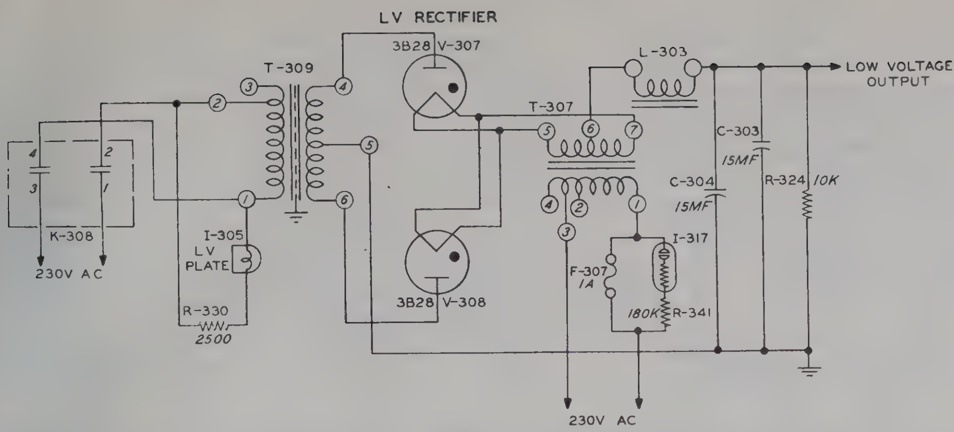


Figure 125. Power Supply Assembly PP-1088/FRT-26, Low-Voltage Supply, Schematic Diagram.

determine the direction of rotation of the powerstat motor. Filament voltage for the thyratrons and control voltage for the bridge circuit are supplied by T-1. T-1 also supplies bias for the thyratron control grids through two 1N34 germanium diodes connected in a full-wave rectifier circuit. C-1 is a bias filter capacitor and R-5 is a bias load resistor. The secondary of T-1 is connected in a bridge circuit consisting of R-6, R-7, and BU-1. BU-1 is a plug-in unit containing two fixed resistors and one non-linear resistor. The bridge resistances are so proportioned that the voltage appearing at the arm of R-355, the output voltage control, is zero. When the output voltage of the regulating system, which is applied to T-1 through a 2:1 step-down transformer, deviates from the set value (230), the secondary voltage of T-1 changes. The resistance value of the non-linear bridge resistor decreases for a decrease in current, and increases for an increase of current, unbalancing the bridge circuit accordingly. The magnitude and phase direction of the voltage which then appears at the arm of R-355 will depend upon the magnitude of voltage deviation and upon whether the voltage has increased or decreased, respectively. The voltage which then appears across the secondary or T-2 is applied to the thyratron grids. If this voltage is great enough, one of the thyratrons fires to close the appropriate motor control relay, RL-1 or RL-2. Since plate voltage for the thyratrons is ac, the phase of the voltage applied to the grids determines which of the tubes fires. The phase in turn depends upon whether the output of the regulating system has become greater than or less than 230 volts. Sensitivity control R-356 is effectively connected across C-1 through the secondary of T-1 and part of the bridge circuit. Varying R-356 therefore varies the bias applied to the thyratron grids and controls the sensitivity of the voltage-sensing circuit. With a greater bias on the grid, a greater voltage is required to fire the tube. Varying output voltage control R-355 applies a voltage to T-2, causing one of the thyratrons to conduct, and changing the voltage required to balance the bridge. The powerstat motor runs to adjust the output voltage of the regulating system until the bridge is again balanced. R-355 should be adjusted so that a regulated voltage of 230 is obtained.

c. Power Supply Assembly PP-1088/FRT-26.

(1) *Bias supply (fig. 124).*

(a) The bias supply for the r-f tubes in Radio Transmitter T-454/FRT-26 develops 400 volts negative to ground. It is loaded by bleeder resistors R-301, R-302, R-343 and R-344 to 0.8 ampere when no grid current is being drawn by any stage. Bias for the intermediate power amplifier is obtained from tap on variable resistor R-302 which allows adjustment for class B operation, or as an aid to keyed waveshape control. Since the final amplifier grid current is in opposition to the bias bleeder current, the load on this supply drops to about 0.2 ampere during "carrier on" conditions. All other r-f stages are provided with cutoff bias from this supply.

(b) This supply is a conventional single-phase full-wave circuit utilizing two 3B28 xenon gas-filled rectifiers. Its filter is a single section choke-input type. A portion of the bleeder current must flow through the

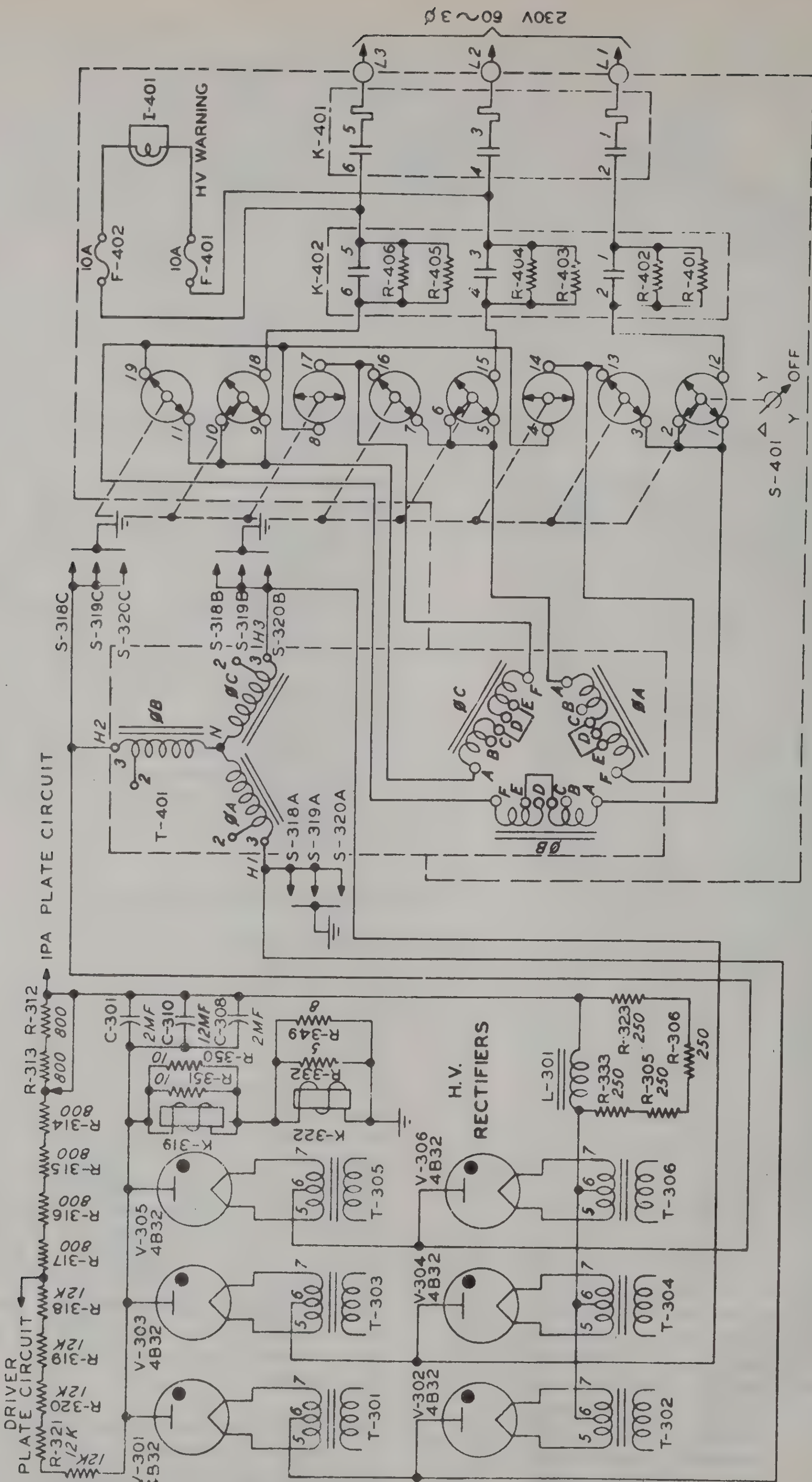


Figure 126. Power Supply Assembly PP-1088/FRT-26, High-Voltage Supply, Schematic Diagram.

operating coil of interlock relay K-307. This relay must be closed before either the low-voltage d-c or the high-voltage d-c power supplies can be energized, and so provides an effective bias interlock.

(2) *Low-voltage d-c supply (fig. 125).* Six hundred volts d-c for crystal oscillator, the frequency multiplier stages, and the driver screen grid, is developed by the low-voltage d-c supply. This supply is a conventional single-phase full-wave circuit utilizing two 3B28 rectifiers. A single section choke-input filter and a bleeder constitute the rest of the supply.

(3) *High-voltage d-c supply (fig. 126).*

(a) The high-voltage supply delivers 5,500 to 6,000 volts d-c for operation of the intermediate power amplifier. This supply utilizes a three-phase full-wave rectifier circuit which requires six type 5B32 xenon gas-filled rectifiers. The filter consists of a single reactor followed by two 2-uf capacitors in parallel. A rather heavy bleeder, dissipating between 1,000 and 6,000 watts, helps maintain constant voltage during keying. As a further effort to minimize the transient voltage dip during keying, the filter reactor is shunted by 1,000 ohms consisting of R-305, R-306, R-323, and R-333. Without these resistors, a voltage equal to 50 percent or more of the supply voltage might momentarily be developed at the moment the key is closed. Such voltage would produce a transient modulation of the keyed pulse. These resistors minimize this transient modulation so that it does not exceed 20 percent to 25 percent at its worst condition. For single-sideband operation or frequency-shift keying, better filtering is obtained with these resistors removed.

(b) Resistors R-308 and R-309 are a series resistance of 42 ohms in the d-c line to the intermediate power amplifier. They are inserted to minimize the current surge in the event of an amplifier tube arc-back or any d-c arc-over in the intermediate power amplifier. Without these resistors, such arc-over or flashbacks would have almost unlimited peak currents, because they would be discharging the filter capacitors directly.

(c) This power supply is capable of delivering approximately 4.5 amperes at its rated voltage. This may appear to be beyond the normal rating of a three-phase full-wave rectifier using 4B32 tubes. According to published information, this rectifier is rated at 3.75 amperes. However, the filament emission rating of any gas-vapor rectifier can be doubled by operation with the filament voltage 60, 90, or 120 degrees out of phase with the plate voltage. This simply allows the plate current pulse to flow during the time that there is very little difference in voltage between the ends of the filament, and thus allows a uniform distribution of the emission current. With normal in-phase operation, on the other hand, plate current flows at a time when the voltage difference between ends of the filament is maximum, in which case, the majority of the emission takes place at the negative end of the filament.

(d) This doubling of average current rating is not often realizable in small-size mercury vapor tubes because the gas temperature rise, which aggravates flash-backs, becomes too great long before double current is reached. Xenon gas, however, is very stable over a wide range of temperatures, and therefore, is not as severely affected by the increase in current as is mercury.

(e) This rectifier has been very carefully phased so that all tubes are operating with either 120 degrees or 60 degrees phasing between filament and plate voltages. It is, therefore, operating quite conservatively at 4.5 amperes.

(f) The high voltage fed to the rectifier tubes is obtained from external Power Transformer TF-196/FRT-26. The primary circuit of this power transformer (T401) has a manually-operated delta-wye-off switch for changing the transformer primary connections or opening them entirely. Also located in the primary line is contactor K-402 and a set of tune-up resistors. Contactor K-402 is operated by the TUNE-OPERATE switch located on the control panel of Power Supply Assembly PP-1088/FRT-26. When the TUNE-OPERATE switch is in the H.V. TUNE position, contactor K-402 is open and tune-up resistors R-401 through R-406 are in series with the primary line, thus dropping the voltage to the power transformer. When the TUNE-OPERATE switch is turned to OPERATE position, contactor K-402 is operated, shorting out the tune-up resistors, and full primary voltage is applied to the primary of power transformer T-401. Filament voltage for the power supply rectifier tubes is pro-

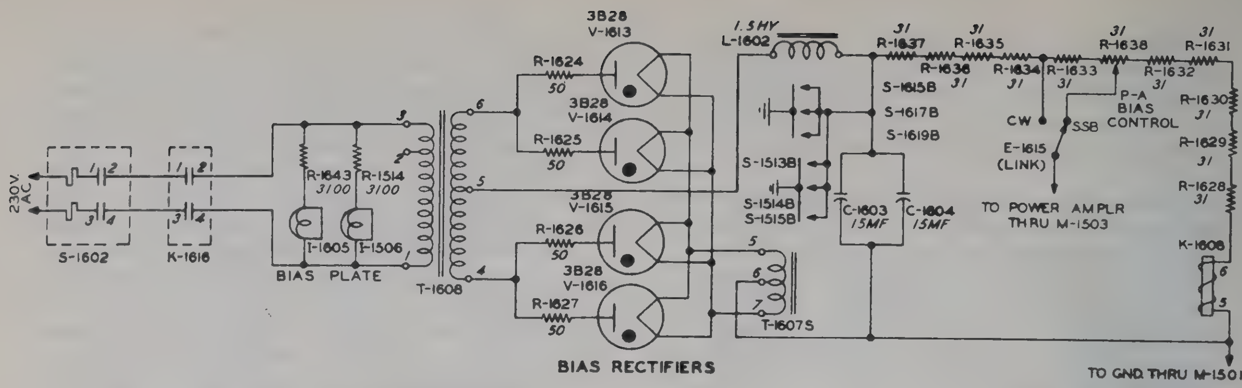


Figure 127. Power Supply Assembly PP-1089/FRT-22, Bias Supply, Schematic Diagram.

vided by transformers T-301 through T-306 inclusive.

(4) *Metering provisions.* Three meters mounted on the upper front door of Power Supply Assembly PP-1088/FRT-26 provide metering of all important voltages connected with Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26. Meter M-301 is a 0-8 kv meter which reads the plate voltage of the intermediate power amplifiers continuously. A two-gang selector switch, S-314, selects the circuits to be metered in connection with meters M-302 and M-303. Meter M-303 is a 0-300 volt meter which checks the regulated primary bus voltage, one phase for each of the first three positions of selector switch S-314. M-303 also reads the right and left intermediate power amplifier filament voltages.

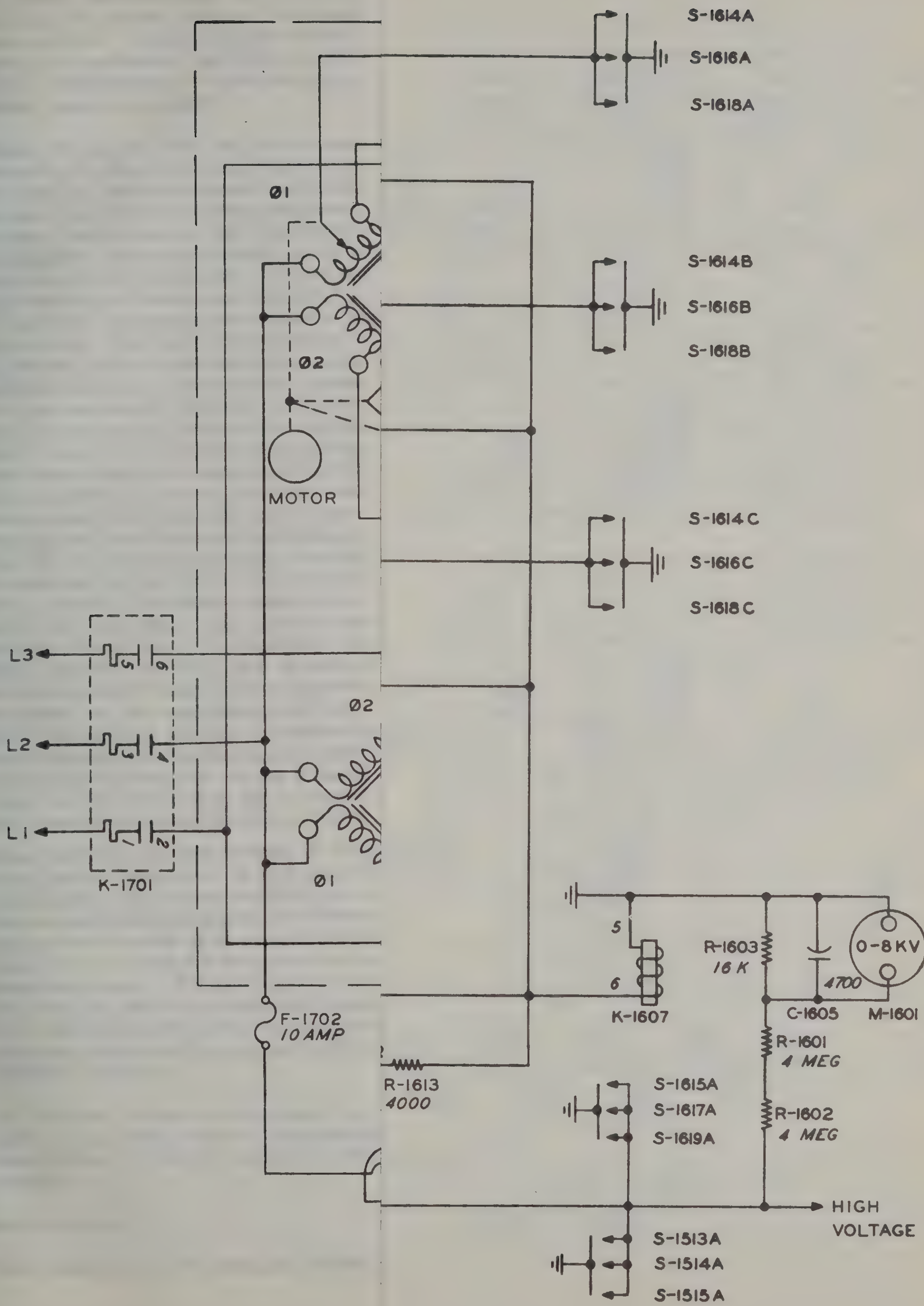
d. Power Supply Assembly PP-1089/FRT-22.

(1) *Bias supply (fig. 127).* The bias supply for the power amplifiers is a single-phase full-wave rectifier circuit using four 3B28 xenon gas-filled tubes. Two tubes are operated in parallel at each of the rectifier positions. Load-dividing resistors are used with each pair of tubes to guarantee that each tube handles one-half of the current. The supply delivers 500 volts negative to ground and is loaded by eleven resistors, R-1628 through R-1637, to about 1.5 amperes. The voltage to the grids of the power amplifiers may be adjusted by a variable tap on the bleeders. When the power amplifiers are drawing grid current, this current is in opposition to that through the bleeders. Hence the current through the bleeder falls to about 0.2 amp. The filter is a single-section choke-input filter. A portion of the bleeder current must flow through the operating coil of interlock relay K-1608. This relay must be closed before the high voltage to the plates of the power amplifier may be turned on.

(2) *High-voltage d-c supply (fig. 128).*

(a) This supply delivers 5,500 to 6,000 volts d-c for operation of the power amplifier. The supply uses a three-phase full-wave rectifier circuit with twelve 4B32 xenon gas-filled tubes. Two tubes are operated in parallel at each of the rectifier positions. Load-dividing resistors are used with each pair of tubes to guarantee that each tube handles one-half of the current. The supply is rated at 11.0 amperes maximum current. The filter consists of a single reactor followed by four 2-uf capacitors in parallel. A rather heavy bleeder, dissipating about 900 watts, is used to help maintain constant voltage during keying. To further minimize the transient voltage dip during keying, 480 ohms is shunted across the filter choke. This resistance prevents a high voltage from building up across this filter reactor during sudden current changes such as occur when key is opened or closed. Without these resistors a voltage equal to 50 percent or more of the supply voltage might momentarily be developed at the moment the key is closed. Such voltages would produce transient modulation of the keyed pulse.

(b) The filament voltage of the rectifier tubes in the high-voltage supply of Power Supply Assembly PP-1089/FRT-22 is 60^{o} or 120^{o} out of phase with the plate voltage. As mentioned under paragraph c. (3) (c) above, this allows the rectifiers to operate at nearly double their rated current because the plate current pulse flows during the time that there is very little difference in voltage between the ends of the filaments. This allows a uniform distribution of the emission current from the filaments.


S-1614A
S-1616A
S-1618A
Ø1
S-1614B
S-1616B
S-1618B
Ø2
MOTOR
S-1614 C
S-1616C
S-1618 C
L3
L2
L1
5
6
3
4
1
2
K-1701
Ø2
Ø1
5
6
K-1607
R-1603
16 K
4700
C-1605
0-8 KV
M-1601
F-1702
10 AMP
R-1601
4 MEG
R-1613
4000
S-1615A
S-1617A
S-1619A
R-1602
4 MEG
HIGH
VOLTAGE
S-1513A
S-1514A
S-1515 A

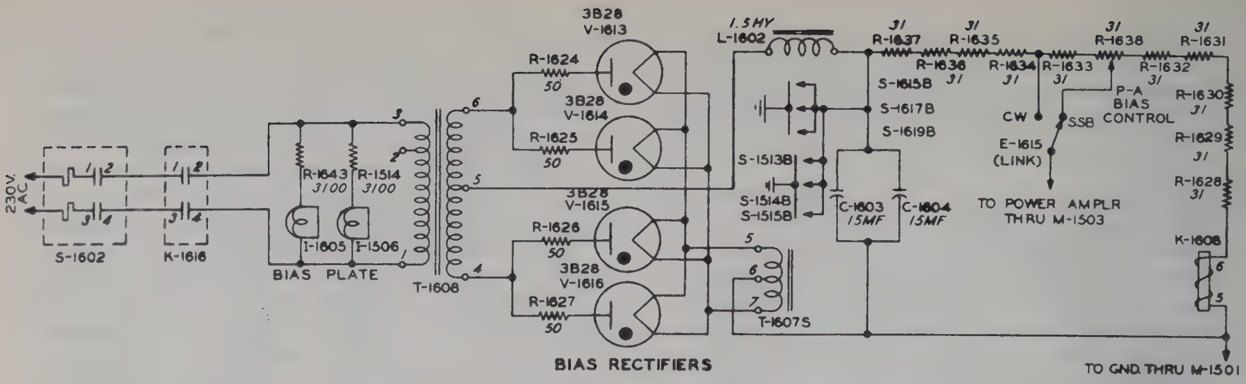


Figure 127. Power Supply Assembly PP-1089/FRT-22, Bias Supply, Schematic Diagram.

vided by transformers T-301 through T-306 inclusive.

(4) *Metering provisions.* Three meters mounted on the upper front door of Power Supply Assembly PP-1088/FRT-26 provide metering of all important voltages connected with Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26. Meter M-301 is a 0-8 kv meter which reads the plate voltage of the intermediate power amplifiers continuously. A two-gang selector switch, S-314, selects the circuits to be metered in connection with meters M-302 and M-303. Meter M-303 is a 0-300 volt meter which checks the regulated primary bus voltage, one phase for each of the first three positions of selector switch S-314. M-303 also reads the right and left intermediate power amplifier filament voltages.

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(2) *High-voltage d-c supply (fig. 128).*

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(b) The filament voltage of the rectifier tubes in the high-voltage supply of Power Supply Assembly PP-1089/FRT-22 is 60^{o} or 120^{o} out of phase with the plate voltage. As mentioned under paragraph c. (3) (c) above, this allows the rectifiers to operate at nearly double their rated current because the plate current pulse flows during the time that there is very little difference in voltage between the ends of the filaments. This allows a uniform distribution of the emission current from the filaments.

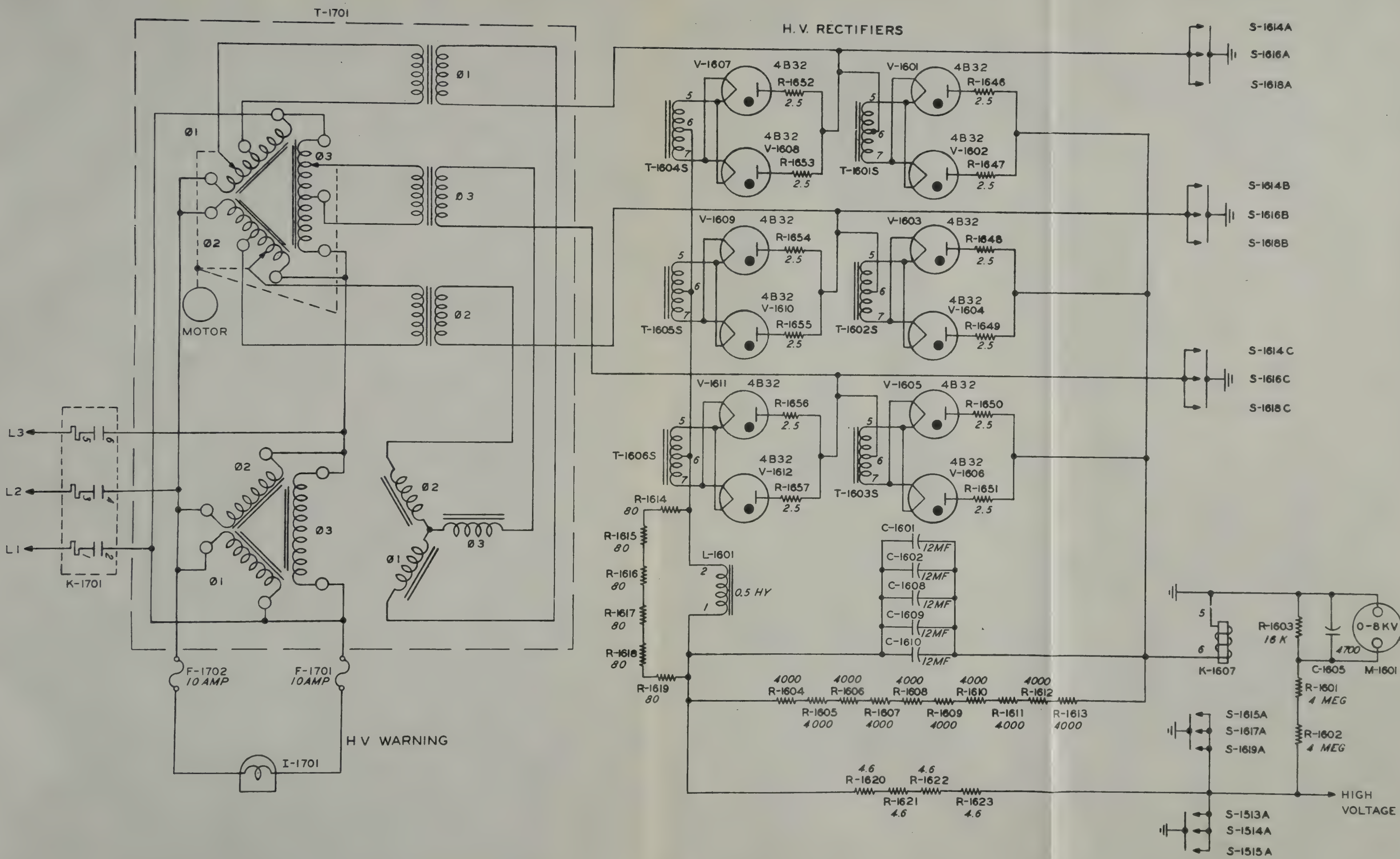


Figure 128. Power Supply Assembly PP-1089/FRT-22, High-Voltage Supply, Schematic Diagram.

(c) High voltage to these rectifier tubes is supplied from the external Power Transformer TF-197/FRT-22. This transformer has a variable output voltage under load from 40 percent below to 10 percent above nominal. A self-contained motor-operated powerstat and a set of buck-boost transformers, as previously explained, make this possible.

(d) Figure 128 shows that the transformer secondary is wye-connected. In series with each of the three power leads from the wye is an additional series secondary winding. The primary of the transformer is composed of two delta-connected primary windings in parallel. One of the delta windings is associated with the wye-connected secondary and provides the high voltage. The buck-boost feature is introduced by the series secondary windings and the other primary winding. These series secondary windings are excited from another set of primary windings which receive their operating voltage from taps on the delta-connected primary. This excitation voltage is varied, both in magnitude and phase, by motor-operated taps on the delta-connected primary. One end of each of the exciting windings is connected to the center taps of the three phases of the delta-connected primary, and the other end of each of the exciting windings is connected to the motor-operated variable tap on each of the delta-primary legs. These taps vary the phase and the magnitude of the voltage of the exciting windings according to how far the tap is from the primary center tap and on which side of the primary center tap the variable tap is located. This power transformer is rated at 73 kva.

(e) Surge resistors R-1620 through R-1623 are a series resistance of 18.4 ohms in the d-c line to the power amplifiers. They are inserted to minimize the current surge in the event of an amplifier tube flashback or any d-c arc-overs in the power amplifiers. Without these resistors such arc-overs or flashbacks would have almost unlimited peak currents because they would be discharging the filter capacitors directly.

(f) The filament voltage for the power amplifier hv rectifier tubes is supplied by transformers T-1601 through T-1606, inclusive.

(3) *Metering provisions.*

(a) Three meters, M-1601 through M-1603, are located on the upper front door of Power Supply Assembly PP-1089/FRT-22. These meters check the voltages in the power unit.

(b) Meter M-1601 is a 0-8 kv meter which continually reads the power amplifier d-c plate voltage. Meter M-1602 reads the voltage of each of the regulated phases on positions 1, 2, and 3 of selector switch S-1621. Meter M-1603 reads the left and right power amplifier filament voltage on positions 4 and 5 of S-1621.

57. Power Control Circuits

(figs. 129 through 134).

Figure 129 is a block diagram of the sequence of operation of power-control breakers, relays, and contactors for a typical starting sequence in which initially all circuit breakers are off. The complete power control circuits are shown in the main schematic (fig. 266). Simplified functional diagrams of the IPA and PA power control circuits (figs. 235 and 236) are located near the end of this manual for use as an aid in trouble shooting the equipment. These diagrams may also be of some value in understanding the interdependence of the power control relays and contactors.

a. Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26. The power control circuits of Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26 are divided into two parts, the filament and blower control circuits and the d-c control circuits.

(1) *Filament starting sequence.*

(a) The normal filament starting sequence can be accomplished with only the filament and blower circuit breakers, S-301, S-304, and S-305 closed and all other circuits de-energized. Starting is accomplished by operating the front-panel toggle switches, S-307 and S-510, which are in series, to their ON positions. These toggle switches have red handles and are also marked as EMERGENCY SHUT DOWN switches. Since they do control the primary relays, they function in the circuit to provide the best possible emergency-off circuit. Further, since both switches must be in the ON position for the equipment to be operating, either switch when thrown to the OFF position will cause a complete shutdown.

(b) If the LOW LEVEL FILAMENT circuit breaker, S-304, is closed, the low-level filament contactor, K-301, may be operated through the front panel toggle FILAMENT-EMERGENCY SHUT DOWN

switches S-307 and S-510. This circuit will function even though all other circuit breakers are open. Next, if the BLOWER circuit breaker, S-301, is closed, or has been previously closed, the blower will start up through blower contactor K-302. Contactor K-302 receives its power from the blower circuit breaker but requires that the low-level filament contactor, K-301, be closed before it can close to start the blowers. Once closed, however, the blower contactor, K-302, will remain closed for a set time interval as determined by the blower hold-on timer K-305 after the filament contactor has been released. All other circuit breakers in the transmitter can be opened once the blowers have started, without shutting down the blowers. The blowers will continue to run until the set time has elapsed or until the BLOWER circuit breaker is turned off. If the POWER AMPLIFIER FILAMENT circuit breaker, S-305, is closed or has previously been closed, the filament transformers will be energized through the power amplifier filament contactor, K-303. Although K-303 receives its power from the POWER AMPLIFIER FILAMENT circuit breaker, it is interlocked through an air interlock, S-511, in the blower air stream, and an auxiliary contact on the low level filament contactor, K-301. An auxiliary contact on power amplifier filament contactor K-303 interlocks with the plate-voltage control circuit, preventing application of plate voltage if the contactor is not closed.

(c) Power amplifier filament voltage is manually controllable over a 10 percent range by means of potentiometers in series with the PA filament transformers. These potentiometers, designated R-326 and R-327, are located on the control panel of Power Supply Assembly PP-1088/FRT-26.

(d) The filament pilot lamps, which are the left-hand lamps on each of the upper front doors, are valuable status indicators. It will be noted that the pilot lamp on Power Supply Assembly PP-1088/FRT-26 indicates that power is present on the primaries of the low-level filament transformers. The filament pilot lamp Radio Transmitter T-454/FRT-26 is connected across the coil of the power amplifier filament contactor so that it indicates that this contactor is closed, that the blowers are operating, and that the power amplifier filament breaker is closed.

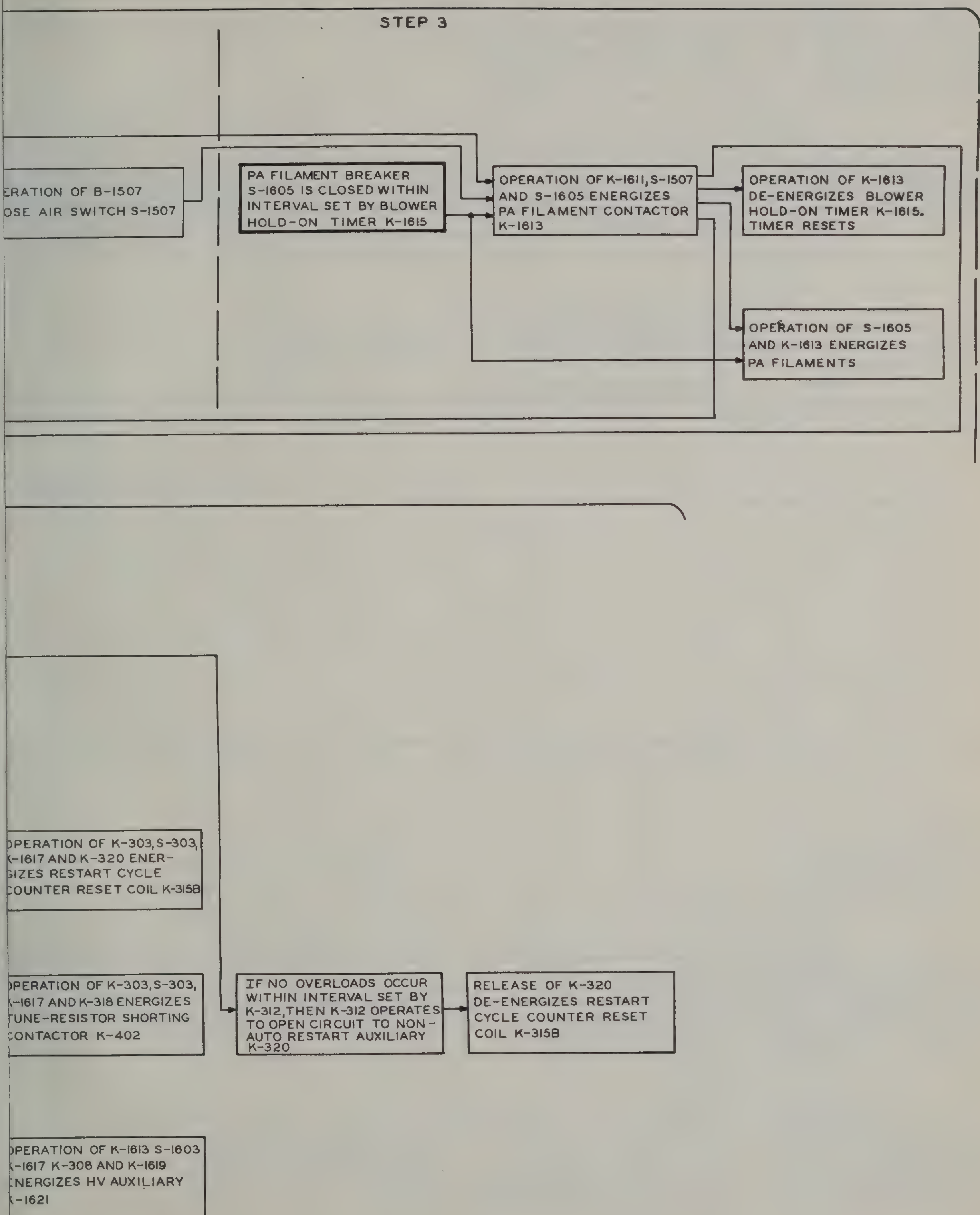
(2) *Plate power sequence.*

(a) Low voltage and bias voltage are obtained through a common breaker, S-302, while the high voltage is supplied through a special motor-operated circuit breaker, K-401, located in Power Supply Control C-1402/FRT-26. Circuit breaker K-401 doubles as a plate start-stop contactor. Control voltage for operation of these d-c supply controls is fed through the CONTROL CIRCUIT breaker S-303. The control circuits are interlocked through the IPA filament contactor, K-303. An energized control circuit is indicated by the lighting of the meter lamps. Arrangement has been made so that the control circuit will not be energized until the CONTROL CIRCUIT breaker, S-303, and the power amplifier filament contactor K-303, are closed. Failure of either the circuit breaker or the contactor will de-energize the control circuit and remove all plate and bias voltages. In addition, the circuit is arranged so that a bias voltage must exist before the low- or high-voltage contactor will close, while the low-voltage supply contactor, K-308, must be energized before the high-voltage contactor, K-401 will remain closed. All contactors directly controlling the d-c supply voltages are interlocked with the cabinet doors through a series-connected door-interlock circuit incorporated in the control circuit.

(b) The bias-voltage contactor, K-306, is energized automatically at the end of the filament-heating-time delay when filament time-delay timer K-304 closes, providing the CONTROL CIRCUIT, LOW VOLTAGE, and BIAS circuit breakers are closed, the blower, low level filament, and power amplifier filament contactors are energized, and all interlocked doors are closed. Low voltage d-c will be applied instantly when the PLATE ON button, which energizes low-voltage contactor K-308 is depressed, providing, however, that bias voltage exists to energize bias interlock K-307.

(c) A bias pilot lamp on the r-f unit and a l-v pilot lamp on the power unit indicate when primary voltage is on in the supplies.

(d) High voltage dc will be applied approximately one-third second after the PLATE ON button is depressed, provided all the interlock circuits are closed. Red pilot lamps on both units indicate that high voltage should be on. The interlocks, in


STEP 3
ERATION OF B-1507
OSE AIR SWITCH S-1507
PA FILAMENT BREAKER S-1605 IS CLOSED WITHIN INTERVAL SET BY BLOWER HOLD-ON TIMER K-1615
OPERATION OF K-1611, S-1507 AND S-1605 ENERGIZES PA FILAMENT CONTACTOR K-1613
OPERATION OF K-1613 DE-ENERGIZES BLOWER HOLD-ON TIMER K-1615. TIMER RESETS
OPERATION OF S-1605 AND K-1613 ENERGIZES PA FILAMENTS
PERATION OF K-303, S-303, -1617 AND K-320 ENER- IZES RESTART CYCLE OUNTER RESET COIL K-315B
PERATION OF K-303, S-303, -1617 AND K-318 ENERGIZES UNE-RESISTOR SHORTING ONTACTOR K-402
IF NO OVERLOADS OCCUR WITHIN INTERVAL SET BY K-312, THEN K-312 OPERATES TO OPEN CIRCUIT TO NON-AUTO RESTART AUXILIARY K-320
RELEASE OF K-320 DE-ENERGIZES RESTART CYCLE COUNTER RESET COIL K-315B
PERATION OF K-1613 S-1603 -1617 K-308 AND K-1619 NERGIZES HV AUXILIARY -1621

switches S-307 and S-510. This circuit will function even though all other circuit breakers are open. Next, if the BLOWER circuit breaker, S-301, is closed, or has been previously closed, the blower will start up through blower contactor K-302. Contactor K-302 receives its power from the blower circuit breaker but requires that the low-level filament contactor, K-301, be closed before it can close to start the blowers. Once closed, however, the blower contactor, K-302, will remain closed for a set time interval as determined by the blower hold-on timer K-305 after the filament contactor has been released. All other circuit breakers in the transmitter can be opened once the blowers have started, without shutting down the blowers. The blowers will continue to run until the set time has elapsed or until the BLOWER circuit breaker is turned off. If the POWER AMPLIFIER FILAMENT circuit breaker, S-305, is closed or has previously been closed, the filament transformers will be energized through the power amplifier filament contactor, K-303. Although K-303 receives its power from the POWER AMPLIFIER FILAMENT circuit breaker, it is interlocked through an air interlock, S-511, in the blower air stream, and an auxiliary contact on the low level filament contactor, K-301. An auxiliary contact on power amplifier filament contactor K-303 interlocks with the plate-voltage control circuit, preventing application of plate voltage if the contactor is not closed.

(c) Power amplifier filament voltage is manually controllable over a 10 percent range by means of potentiometers in series with the PA filament transformers. These potentiometers, designated R-326 and R-327, are located on the control panel of Power Supply Assembly PP-1088/FRT-26.

(d) The filament pilot lamps, which are the left-hand lamps on each of the upper front doors, are valuable status indicators. It will be noted that the pilot lamp on Power Supply Assembly PP-1088/FRT-26 indicates that power is present on the primaries of the low-level filament transformers. The filament pilot lamp Radio Transmitter T-454/FRT-26 is connected across the coil of the power amplifier filament contactor so that it indicates that this contactor is closed, that the blowers are operating, and that the power amplifier filament breaker is closed.

(2) *Plate power sequence.*

(a) Low voltage and bias voltage are obtained through a common breaker, S-302, while the high voltage is supplied through a special motor-operated circuit breaker, K-401, located in Power Supply Control C-1402/FRT-26. Circuit breaker K-401 doubles as a plate start-stop contactor. Control voltage for operation of these d-c supply controls is fed through the CONTROL CIRCUIT breaker S-303. The control circuits are interlocked through the IPA filament contactor, K-303. An energized control circuit is indicated by the lighting of the meter lamps. Arrangement has been made so that the control circuit will not be energized until the CONTROL CIRCUIT breaker, S-303, and the power amplifier filament contactor K-303, are closed. Failure of either the circuit breaker or the contactor will deenergize the control circuit and remove all plate and bias voltages. In addition, the circuit is arranged so that a bias voltage must exist before the low- or high-voltage contactor will close, while the low-voltage supply contactor, K-308, must be energized before the high-voltage contactor, K-401 will remain closed. All contactors directly controlling the d-c supply voltages are interlocked with the cabinet doors through a series-connected door-interlock circuit incorporated in the control circuit.

(b) The bias-voltage contactor, K-306, is energized automatically at the end of the filament-heating-time delay when filament time-delay timer K-304 closes, providing the CONTROL CIRCUIT, LOW VOLTAGE, and BIAS circuit breakers are closed, the blower, low level filament, and power amplifier filament contactors are energized, and all interlocked doors are closed. Low voltage d-c will be applied instantly when the PLATE ON button, which energizes low-voltage contactor K-308 is depressed, providing, however, that bias voltage exists to energize bias interlock K-307.

(c) A bias pilot lamp on the r-f unit and a l-v pilot lamp on the power unit indicate when primary voltage is on in the supplies.

(d) High voltage dc will be applied approximately one-third second after the PLATE ON button is depressed, provided all the interlock circuits are closed. Red pilot lamps on both units indicate that high voltage should be on. The interlocks, in

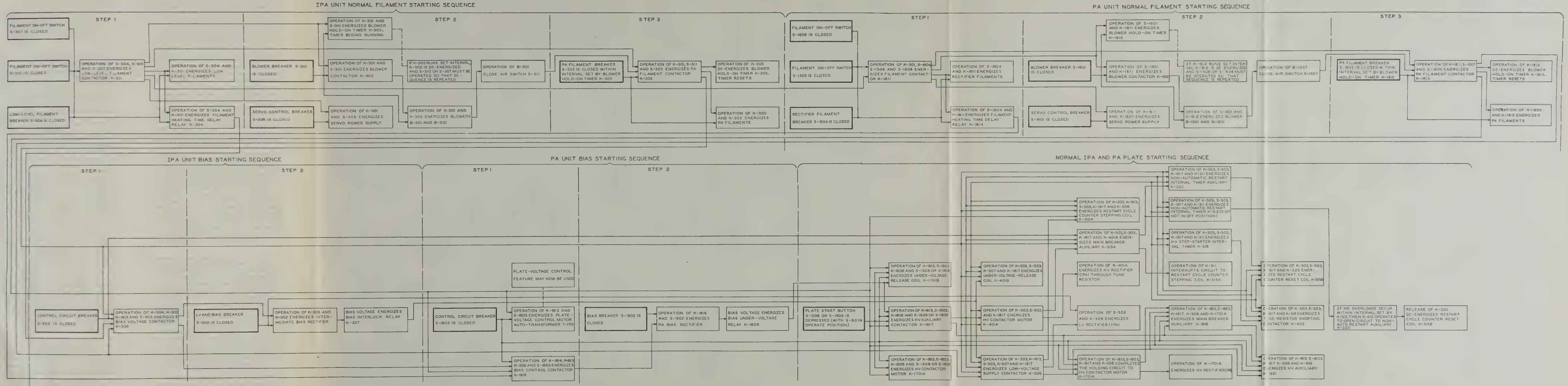


Figure 129. Normal Starting Sequence, Block Diagram.

addition to the one already mentioned, are the d-c overload circuits and the manual TUNE-OPERATE switch. The d-c overload relays consist of left IPA overload K-324, right IPA overload K-325, high voltage d-c overload K-319, and r-f driver overload, K-326. Their respective contacts are connected in a series circuit with the motor-operated high-voltage circuit breaker undervoltage release coil K-401B.

(e) The circuit breaker for the high-voltage supply is a high-speed, high-interrupting-capacity unit with motor operation and an undervoltage-release coil. This circuit breaker serves as a high-voltage on-off contactor and simultaneously provides a-c overload protection through the use of both thermal and magnetic trip units. The thermal trip unit is set at 125 amperes and will allow continuous operation at up to twenty percent overload and five seconds of operation at 800 percent overload. The magnetic trip unit is adjustable from 400 to 1250 amperes and is accessible for adjustment when the front cover of the circuit breaker is removed. The normal recommended setting is 400 amperes. In the circuit diagram (see main schematic, fig. 266), the complete circuit breaker is designated K-401. The motor is shown as a circle and the undervoltage-release coil as a winding. The undervoltage-release coil must be continuously energized to hold the circuit breaker closed. Opening this undervoltage circuit causes the breaker to trip out instantly. This coil receives its energy from the control circuit through the d-c overload contacts, the interlocking contacts on both the bias-voltage supply and low-voltage supply contactors and all of the door interlocks. Opening of any of these contacts causes the breaker to trip out instantly. The circuit is arranged so that if the main circuit breaker undervoltage-release coil is de-energized and the TUNE-OPERATE switch is in the L.V. TUNE position, the circuit-breaker starting motor will run the circuit breaker to the reset position and stop without closing the main contacts when the PLATE ON button is depressed. If, however, the TUNE-OPERATE switch is in either the H.V. TUNE or OPERATE position and the undervoltage-release coils are still de-energized, the circuit-breaker starting motor will continue to run but still will not close the main contacts while the PLATE ON button is depressed. In other words, the undervoltage-release coil must be energized before the main circuit breaker contacts will close, even though the motor will appear to function normally.

(f) The manual TUNE-OPERATE switch, previously mentioned as an additional interlock on the high voltage, is a three-position switch. In the first position, L.V. TUNE, the main circuit breaker motor circuit is opened for the closing direction so that the circuit breaker can run to the reset position but no further. Only low-voltage dc can be applied in this position. The second position, H.V. TUNE, allows the main circuit breaker to close, applying high voltage but leaving resistors in the primary line of the high voltage transformer for tuning purposes or reduced power output. The third position, OPERATE, activates the high-voltage step-starter interval timer, K-318, through the contacts of the main breaker auxiliary, K-311, which in turn activates the tune-resistor shorting contactor, K-402, thus shorting the tuning resistors and providing normal operation. The TUNE-OPERATE switch can be operated from the L.V. TUNE position to H.V. TUNE or OPERATE position without shutting down the plate voltage. Once the high-voltage supply has been turned on, the TUNE-OPERATE switch will not shut it off. This supply can be switched back and forth between the high-voltage tune and the operate conditions at the will of the operator, but a return of the low-voltage tune conditions requires that the d-c voltages be manually shut down and restarted by means of the momentary push buttons with the TUNE-OPERATE switch in the L.V. TUNE position.

(3) *Automatic restart circuit.* This circuit incorporates a complete automatic restart-after-overload feature. For a short interval of time, adjustable from 0 to 30 seconds on non-automatic restart interval timer K-312 after manual startup, any overload will cause the low-voltage and power-amplifier-voltage supplies to shut off and stay off. During this interval, non-automatic restart auxiliary K-320 complete the circuit of the restart cycle counter reset coil, K-315B, preventing the restart cycle counter, K-315, from stepping to any other than the first contact. At the end of this interval, the non-automatic restart auxiliary is de-energized, allowing recycling to take place in the event of subsequent overloads.

(a) The number (adjustable from 0-8) of automatic recycles before the transmitter

locks out can be preset by manual operation of the RECYCLE SELECTOR switch, S-317. However, these consecutive overloads must occur within an adjustable time interval of 0-15 minutes as determined by the automatic restart interval timer, K-316, to cause the supplies to lock out.

(b) If an overload occurs subsequent to the initial non-automatic restart period following manual start, it energizes the restart interval timer auxiliary, K-313, which locks up through the contacts of automatic restart interval timer K-316, resulting in the lighting of the automatic restart indicators, which are designated OVERLOAD on the front of each bay. Timer K-313 in turn energizes the lockout alarm auxiliary, K-321, and the automatic restart interval timer, K-316. The occurrence of this overload also energizes the restart cycle counter stepping coil, K-315A, resulting in the restart cycle counter, K-315, moving to the next contact. If no more overloads occur within the interval of time determined by the automatic restart interval timer, the restart cycle counter reset coil, K-315B, is energized, resetting the restart cycle counter to its initial position that followed manual start. If, however, the overloads and automatic restarts continue to occur within this interval of time, the restart cycle counter is stepped to the contact that opens the circuit to the non-automatic restart interval timer, K-312, which results in the low voltage contactor, K-308, being deenergized, causing the supplies to lock out and the lockout alarm horn, I-310, to sound.

(4) *Automatic shutdown circuit.* An automatic shutdown circuit is incorporated in the control circuits of this transmitter. It consists of one thermal relay, K-322, located in the cathode circuit of the power amplifier and an automatic shutdown time delay timer, K-323, that is adjustable from 0 to 30 minutes. The thermal-relay contacts are normally closed. The energizing element in this relay is a heater which controls the temperature of a bimetallic strip upon which the moving contact is mounted. Therefore, when the power amplifier is drawing current either continuously or intermittently, the heater causes the contacts to part after a few seconds delay. When the current through the heater is interrupted, the bimetallic element starts to cool so that in the event the interruption continues for 60 seconds or more, the contacts again close. These contacts are in series with the operating coil of the automatic shutdown timer, K-323, so that any time they are closed, this timer is energized. This timer in turn has its normally closed contacts in series with a low-voltage contactor coil, K-308, so that in the event this timer is allowed to complete its cycle, power to K-308 will be interrupted, thus shutting down the low voltage and consequently the high-voltage d-c. This circuit can be rendered inoperative, if so desired, by manual operation of a toggle switch located on the front panel of Power Supply Assembly PP-1088/FRT-26 and designated AUTO SHUTDOWN.

b. R-F Amplifier AM-738/FRT-22 and Power Supply Assembly PP-1089/FRT-22. This power control circuit is an extension of the power control circuit discussed in paragraph a. (1) through a. (4) above and contains only those additional circuits and relays that are necessary to interlock it with the circuits in Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26.

(1) *Circuit functions.*

(a) To control the power-amplifier bias-supply primary voltage.

(b) To control the power amplifier high-voltage supply primary voltage.

(2) How interlocked with Radio Transmitter T-454/FRT-26 and Power Supply Assembly PP-1088/FRT-26 Circuits:

(a) The bias supply cannot be turned on unless the intermediate amplifier bias supply is on.

(b) Pressing the PLATE ON button automatically turns on the prior equipment low and high voltages in Radio Transmitter T-454/FRT-26.

(c) Operation of the PLATE ON buttons on Radio Transmitter T-454/FRT-26 or Power Supply Assembly PP-1088/FRT-26 does not turn on the power amplifier high voltage in R-F Amplifier AM-738/FRT-22 or Power Supply Assembly PP-1089/FRT-22.

(d) Overloads any place in the two circuits operate through the intermediate power amplifier overload recycle circuit to cause an automatic restart, or lockout, as the case may be.

(e) The complete power amplifier control can be disabled and bypassed so that the intermediate power amplifier circuits

can work independently, by operating the PA CONTROL switch, S-1608, to the OFF position.

(3) *Operation of the power amplifier control circuit.* In several places within each circuit, interlocking contacts on relays in the opposite circuit are used. In the main schematic and the description that follows, those relays and contacts that are physically associated with the intermediate power amplifier control circuit and located within the main transmitter enclosure are identified by three-figure symbol numbers starting with the numeral 3 (K-308, for example). Those components physically associated with intermediate power amplifier control, but located external to the main enclosure, have three-figure symbol numbers starting with numeral 4 (K-402, for example). Those components physically associated with power amplifier control and located within the main enclosure are identified by four-figure symbols starting with the numeral 16 (K-1619, for example). Those components associated with power amplifier control, but physically located external to the main transmitter enclosure, are identified by four figure symbols starting with numeral 17 (T-1701, for example).

(a) Starting with the CONTROL CIRCUIT breaker S-1603 closed, all meter lights on Radio Transmitter T-454/FRT-26, R-F Amplifier AM-738/FRT-22, Power Supply Assembly PP-1088/FRT-26, and Power Supply Assembly PP-1089/FRT-22 will be lighted.

(b) P.A. CONTROL switch S-1608 is in the ON position.

(c) Power amplifier filament contactor K-1613 must be closed.

(d) A circuit can be completed to the hv power transformer raise-lower motor B-1701 through autotransformer T-1701A, P.A. PLATE VOLTAGE switch S-1622, and limit switches S-1701 and S-1702. Operation of the P.A. PLATE VOLTAGE switch will cause the motor driving the variable transformer T-1701B to run, and if the switch is held closed long enough, to operate the appropriate limit switch S-1701 or S-1702 and limit light switch S-1703 or S-1704, thus lighting I-1608 or I-1609 on the control panel.

(e) If the bias is turned on in the intermediate power amplifier, contactor K-306 will be closed, and its interlocking contact in the amplifier control will also be closed. If the rectifier filament time delay K-1614 has operated, bias contactor K-1616 will close. If the bias breaker S-1602 is closed, the bias supply will be energized. The presence of bias will be indicated by the orange flag behind the glass of the bias-undervoltage relay K-1608. Note that the intermediate power amplifier bias contactor, K-307, receives its current through the door interlocks. The power amplifier interlocks are connected in series with the IPA bias and hence both bias supplies.

(f) High-voltage starting may require two sequences of events. IPA supplies may already be on, in which case only the power amplifier supply will go on, or all supplies may be off so that depressing the PLATE ON button will bring the low-voltage supply and the intermediate amplifier supply on simultaneously. This explanation will assume the latter condition.

(g) Depressing PLATE ON button S-1508 or S-1609 energizes K-1617 through K-320 or K-1621. Contacts of K-1617 shunt IPA PLATE ON switches S-309 and S-519 to turn on the IPA plate power supplies. A contact of K-1617 in series with a contact of K-308, the low-voltage plate contacter, serves as a locking circuit around PLATE ON switches S-1508 and S-1609.

(h) Simultaneously with the above operation, the main-breaker undervoltage-release coil, K-1701B, is energized through the contacts of overload relays K-1601 through K-1607.

(i) Also simultaneous with the above operation, the main-breaker motor, K-1701A, receives a voltage through normally-closed contacts K-1701C and K-1701D within the main breaker automatic-sequence and auxiliary switches. The main-breaker motor operates to close the main breaker. Contacts K-1701D and K-1701E are a single-pole, double-throw automatic sequence switch. Contact K-1701D is closed when the motor is in the breaker-closed position.

Note. The breaker contacts may be open even though the arm is in the closed position if the latch mechanism has been tripped and not reset. As the motor operates, it resets the latch mechanism. In the off position, K-1701D opens and K-1701E closes so the motor continues to run, this time operating the breaker arm

to the closed position. In the closed position, contacts K-1701D and K-1701E again reverse, but if the breaker contacts close normally, auxiliary contact K-1701C opens and thus prevents further operation of the motor. If, however, the contacts fail to close because of an open circuit to the undervoltage-release coil, or a misadjustment of the breaker, K-1701C will not open and the motor will continue to run, starting the closing cycle over again. It will continue to repeat the cycle until it closes or the PLATE OFF button is depressed.

(j) Simultaneously with the closing of the main-breaker contacts auxiliary contact K-1701F closes, thus completing a circuit to the main breaker auxiliary relay K-1619, plate-hour timer M-1605, and the H.V. PLATE lamps I-1507 and I-1606.

(k) The operation of K-1619 energizes hv auxiliary relay K-1621. It will be noted that the plate-start-locking hv-auxiliary relay K-1617 is energized through contacts of K-1619, K-1621, and/or K-320. Thus when the main breaker closes, the interlock path changes from the normally-closed contact on K-1621 to the normally-open contact on K-1619 without interruption. When K-320, the non-automatic restart relay, is energized, its contacts in this group are open so that relay K-1619 alone maintains the circuit to the locking relay K-1617. If an overload should occur which trips the main breaker, K-1701, its normally-closed contact will not reclose until a short time after main breaker auxiliary K-1619 opens. Thus there is a short time interval during which neither K-1619 nor K-1621 maintains the circuit to K-1617. Refer to Flow chart, figs. 130 and 131.

(l) The above sequence, which ended in a lockout, assumed that K-320 was energized. If K-320 were not energized, the conditions for an automatic reclosure after overload would exist. In this case, K-1617 would remain closed regardless of the operation of K-1619 or K-1621. If, during this time, an overload should occur which trips the main breaker, its auxiliary contact K-1701C would close, and since contact K-1701D is closed when the breaker is closed, the circuit to the breaker motor would be complete, thus starting it on its closing cycle. Each time the breaker operates, however, K-1619, its auxiliary, and K-1621, the second auxiliary, also operate. These two relays have contacts in series with the overload circuit of the intermediate power amplifiers and are arranged in such a manner that the circuit is maintained during a closing sequence, but is momentarily interrupted during an opening sequence. This momentary interruption trips the IPA main circuit breaker as if an overload has occurred in that portion of the circuit. The IPA recycle and lockout circuits are thus made effective during an amplifier overload to cause both main breakers to recycle or lock out as the case may be. See figs 132, 133, and 134.

(m) An additional contact of K-1617 in the intermediate power amplifier control circuit is a normally-open contact in series with the non-automatic restart interval timer K-312. This contact causes K-312 to remain inoperative and thus keeps the circuits in a non-automatic restart condition until the power amplifier high-voltage supply is turned on, even though the intermediate power amplifier high-voltage circuits may be closed.

(n) An element of the P.A. CONTROL switch S-1608 is connected across each point in the intermediate power amplifier circuit where relay contacts or door interlocks of the power amplifier control are inserted. This switch, when operated to the OFF position, completely disables the power amplifier control circuit and simultaneously sets up the intermediate power amplifier control circuit for independent operation. (See figs 235 and 236.)

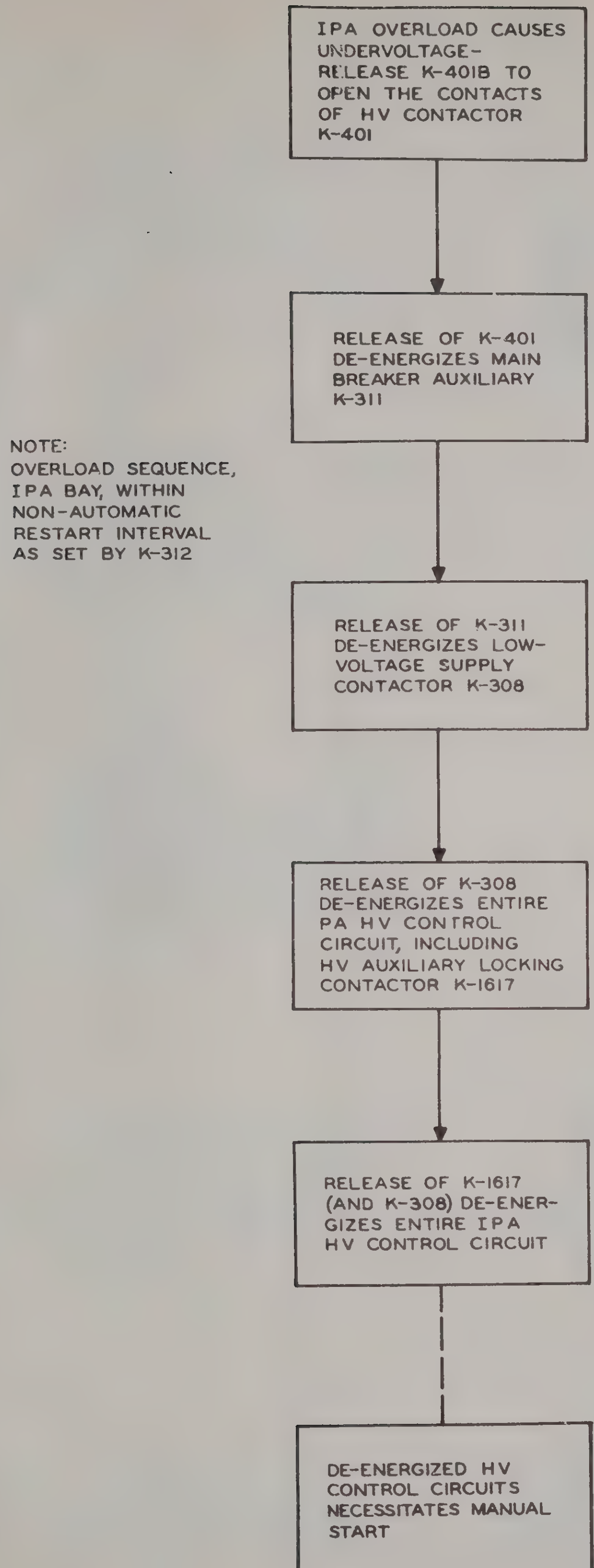


Figure 130. IPA Overload Sequence, Within Non-Automatic Restart Interval, Block Diagram.

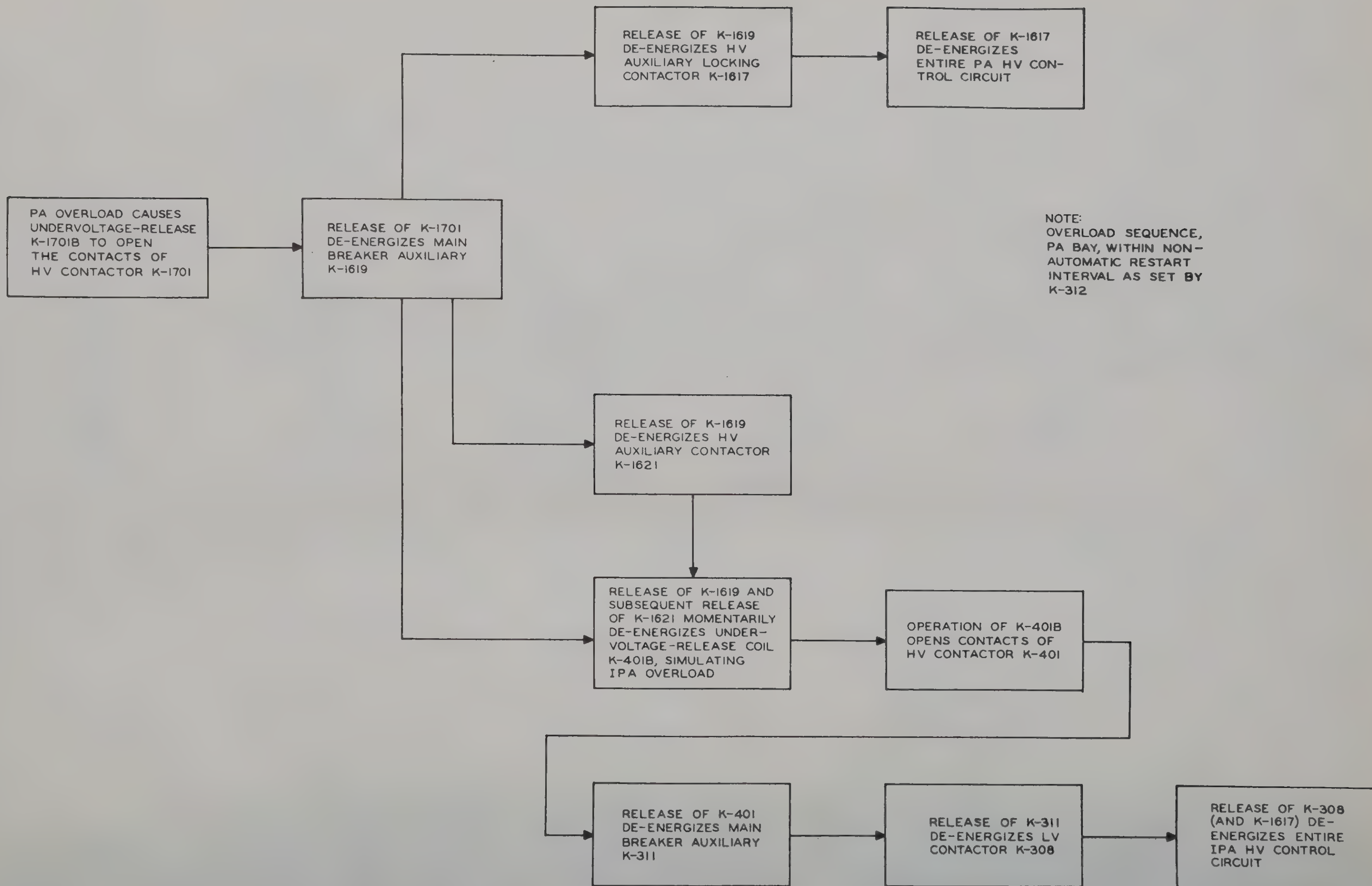
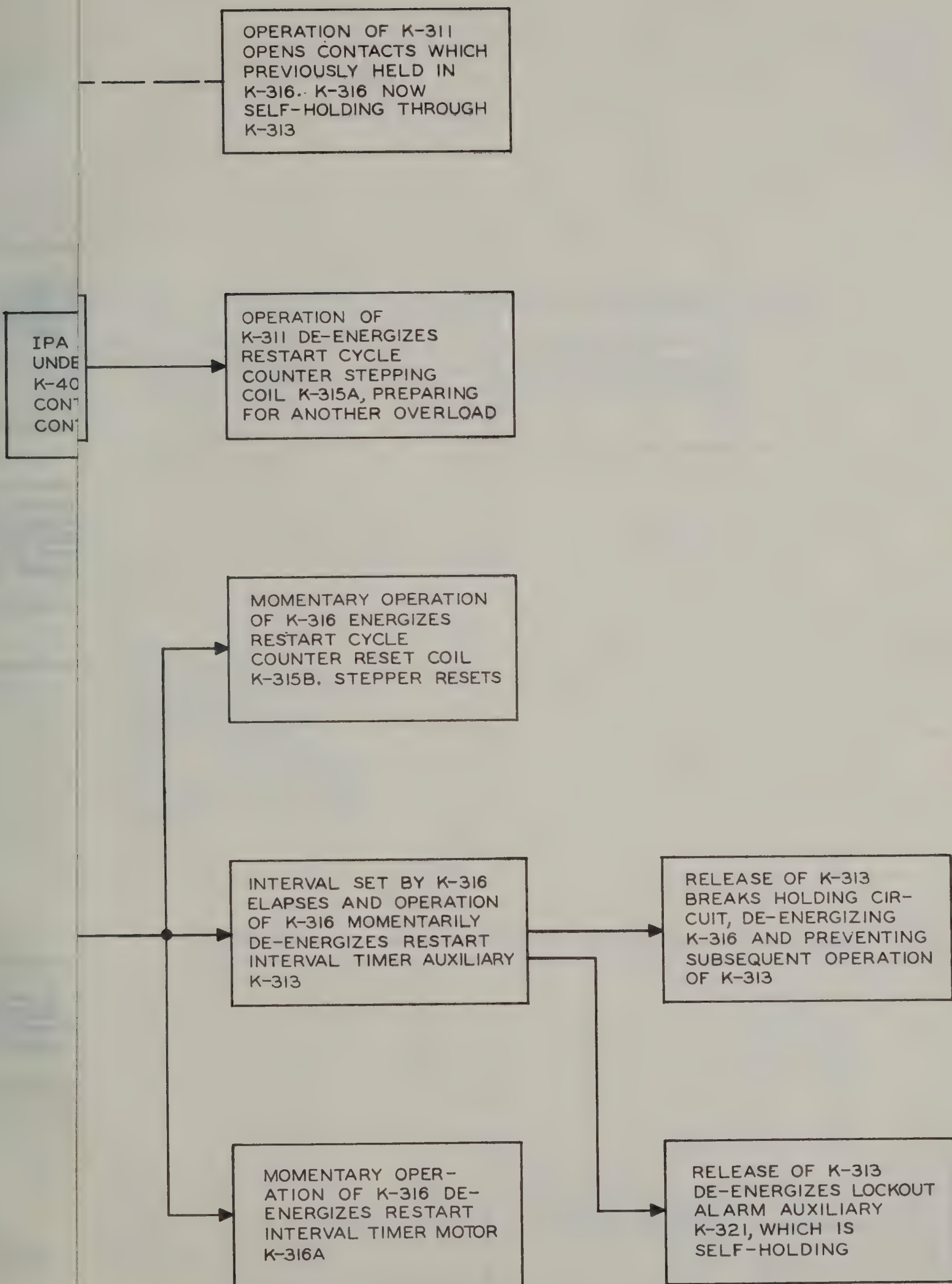


Figure 131. PA Overload Sequence, Within Non-Automatic Restart Int erval, Block Diagram.


OPERATION OF K-311 OPENS CONTACTS WHICH PREVIOUSLY HELD IN K-316. K-316 NOW SELF-HOLDING THROUGH K-313
OPERATION OF K-311 DE-ENERGIZES RESTART CYCLE COUNTER STEPPING COIL K-315A, PREPARING FOR ANOTHER OVERLOAD
MOMENTARY OPERATION OF K-316 ENERGIZES RESTART CYCLE COUNTER RESET COIL K-315B. STEPPER RESETS
INTERVAL SET BY K-316 ELAPSES AND OPERATION OF K-316 MOMENTARILY DE-ENERGIZES RESTART INTERVAL TIMER AUXILIARY K-313
RELEASE OF K-313 BREAKS HOLDING CIRCUIT, DE-ENERGIZING K-316 AND PREVENTING SUBSEQUENT OPERATION OF K-313
MOMENTARY OPERATION OF K-316 DE-ENERGIZES RESTART INTERVAL TIMER MOTOR K-316A
RELEASE OF K-313 DE-ENERGIZES LOCKOUT ALARM AUXILIARY K-321, WHICH IS SELF-HOLDING

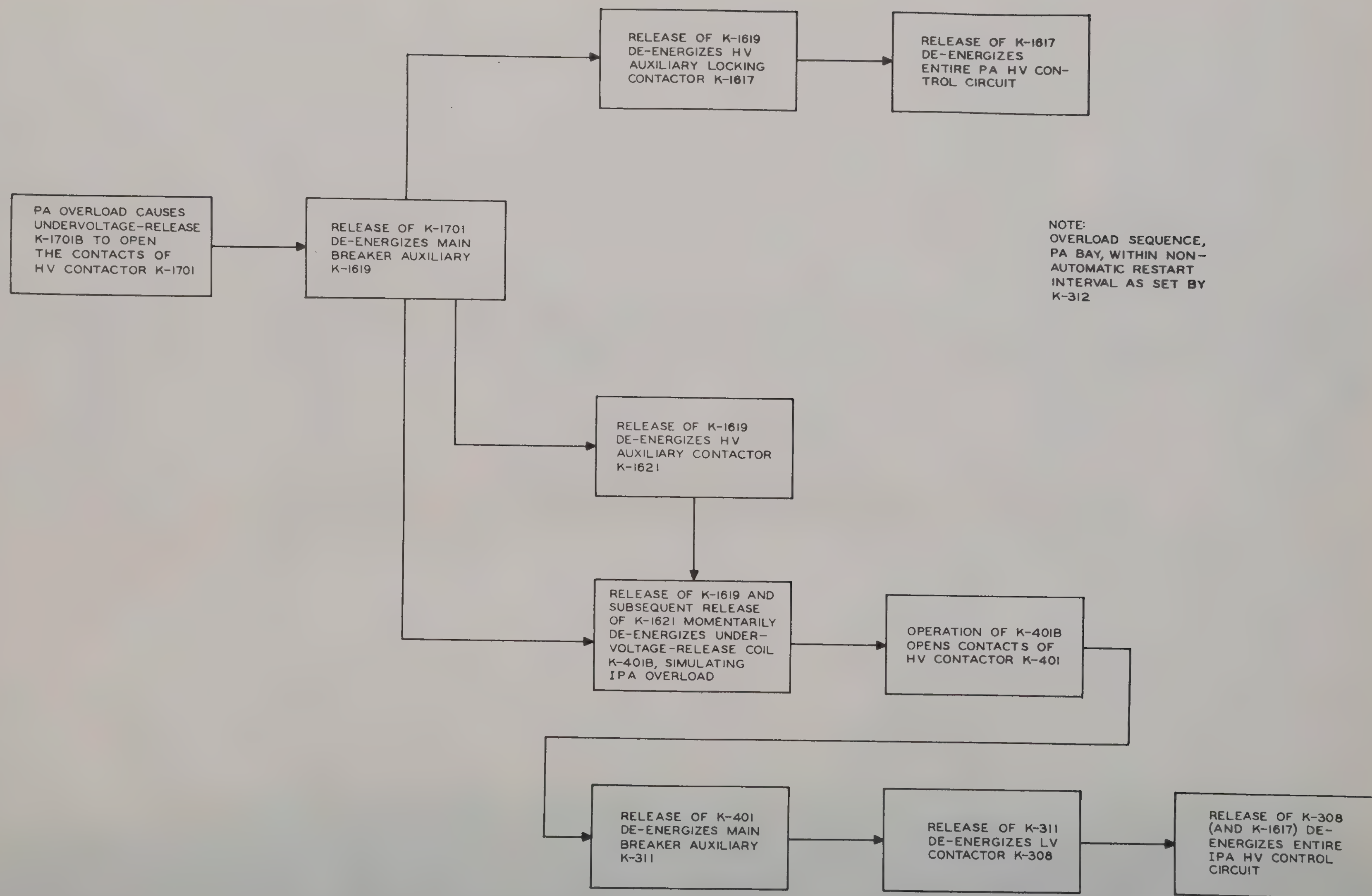


Figure 131. PA Overload Sequence, Within Non-Automatic Restart Interval, Block Diagram.

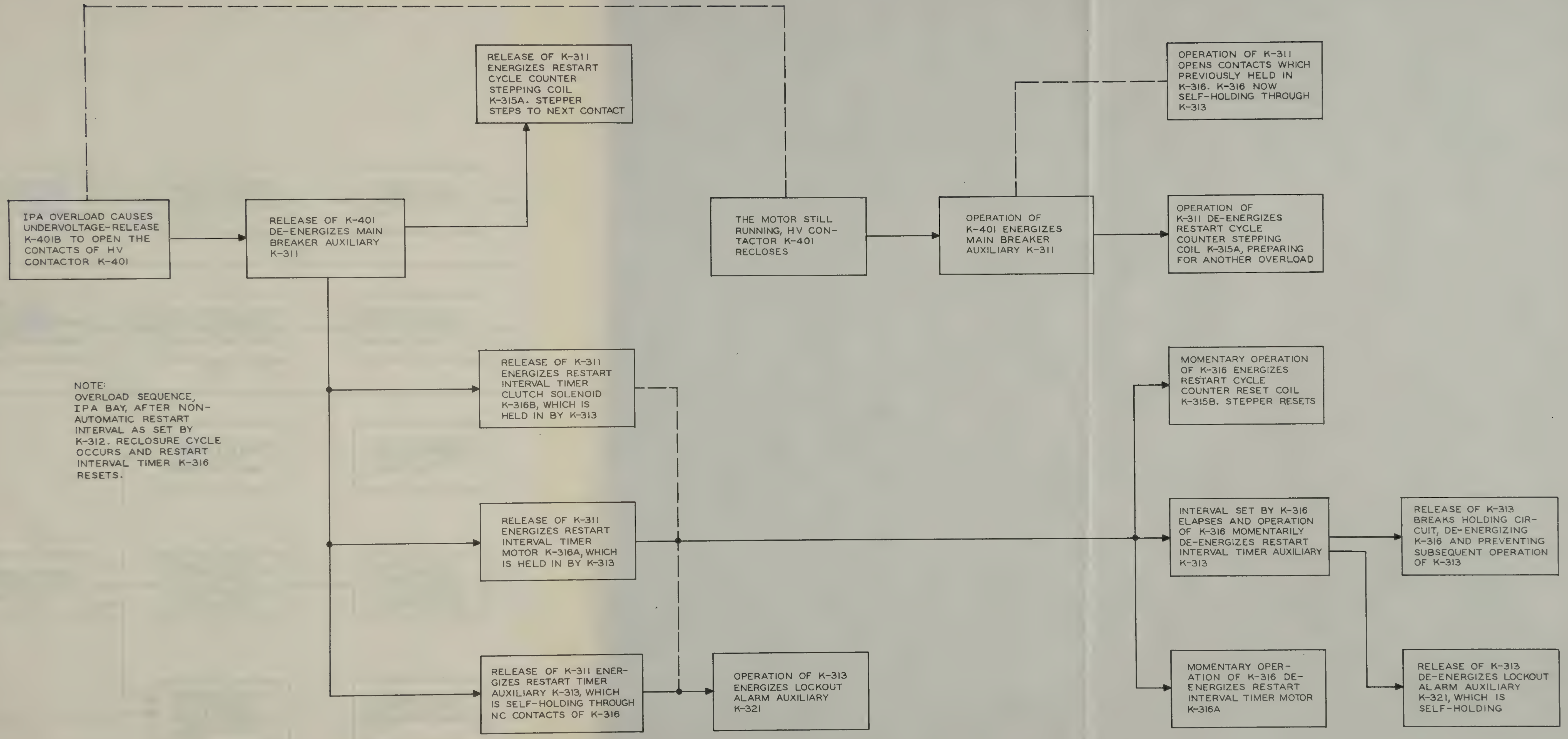
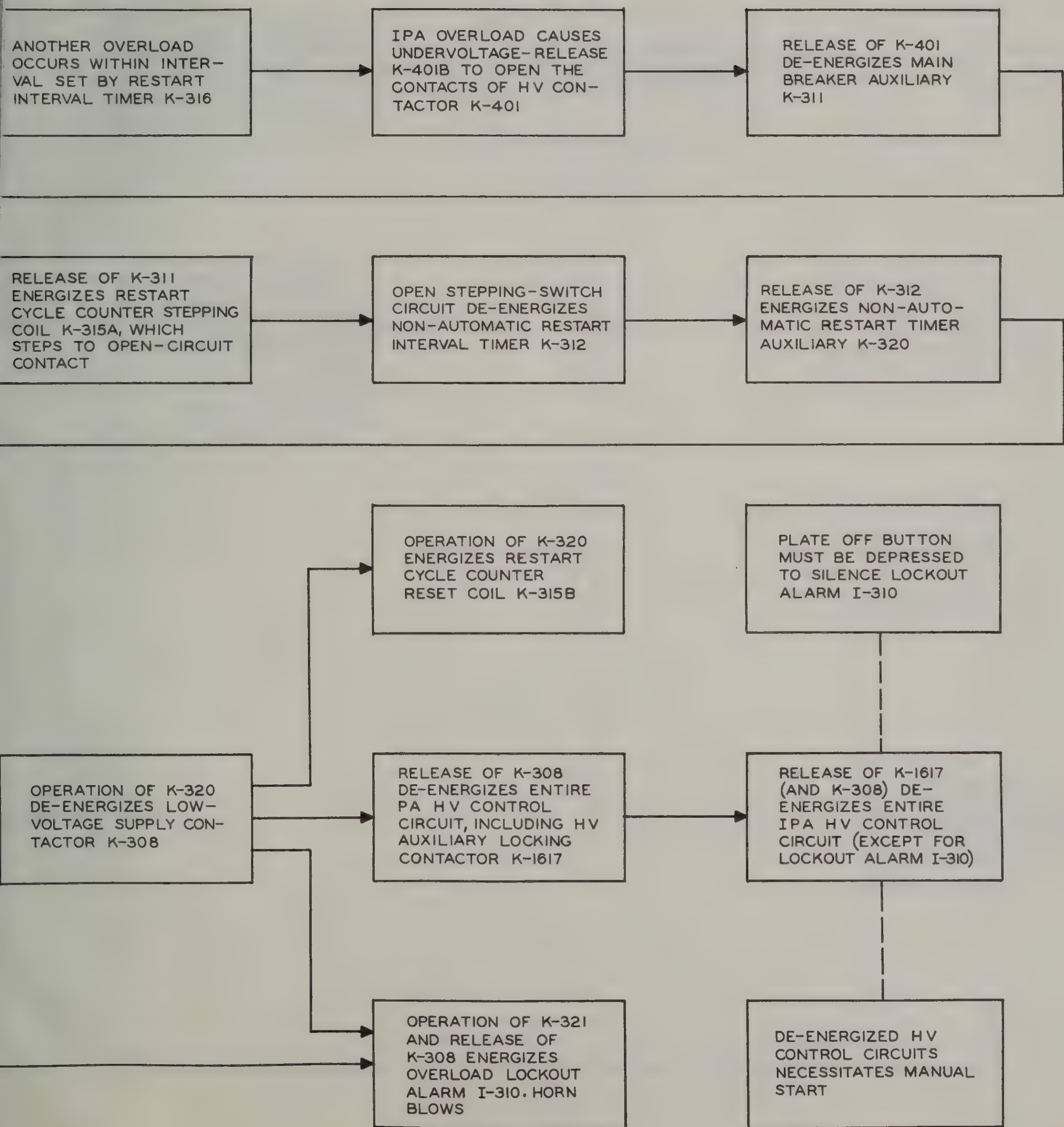


Figure 132. Normal Overload and Restart Cycle, Block Diagram.


ANOTHER OVERLOAD OCCURS WITHIN INTERVAL SET BY RESTART INTERVAL TIMER K-316
IPA OVERLOAD CAUSES UNDERVOLTAGE-RELEASE K-401B TO OPEN THE CONTACTS OF HV CONTACTOR K-401
RELEASE OF K-401 DE-ENERGIZES MAIN BREAKER AUXILIARY K-311
RELEASE OF K-311 ENERGIZES RESTART CYCLE COUNTER STEPPING COIL K-315A, WHICH STEPS TO OPEN-CIRCUIT CONTACT
OPEN STEPPING-SWITCH CIRCUIT DE-ENERGIZES NON-AUTOMATIC RESTART INTERVAL TIMER K-312
RELEASE OF K-312 ENERGIZES NON-AUTOMATIC RESTART TIMER AUXILIARY K-320
OPERATION OF K-320 ENERGIZES RESTART CYCLE COUNTER RESET COIL K-315B
PLATE OFF BUTTON MUST BE DEPRESSED TO SILENCE LOCKOUT ALARM I-310
OPERATION OF K-320 DE-ENERGIZES LOW-VOLTAGE SUPPLY CONTACTOR K-308
RELEASE OF K-308 DE-ENERGIZES ENTIRE PA HV CONTROL CIRCUIT, INCLUDING HV AUXILIARY LOCKING CONTACTOR K-1617
RELEASE OF K-1617 (AND K-308) DE-ENERGIZES ENTIRE IPA HV CONTROL CIRCUIT (EXCEPT FOR LOCKOUT ALARM I-310)
OPERATION OF K-321 AND RELEASE OF K-308 ENERGIZES OVERLOAD LOCKOUT ALARM I-310. HORN BLOWS
DE-ENERGIZED HV CONTROL CIRCUITS NECESSITATES MANUAL START

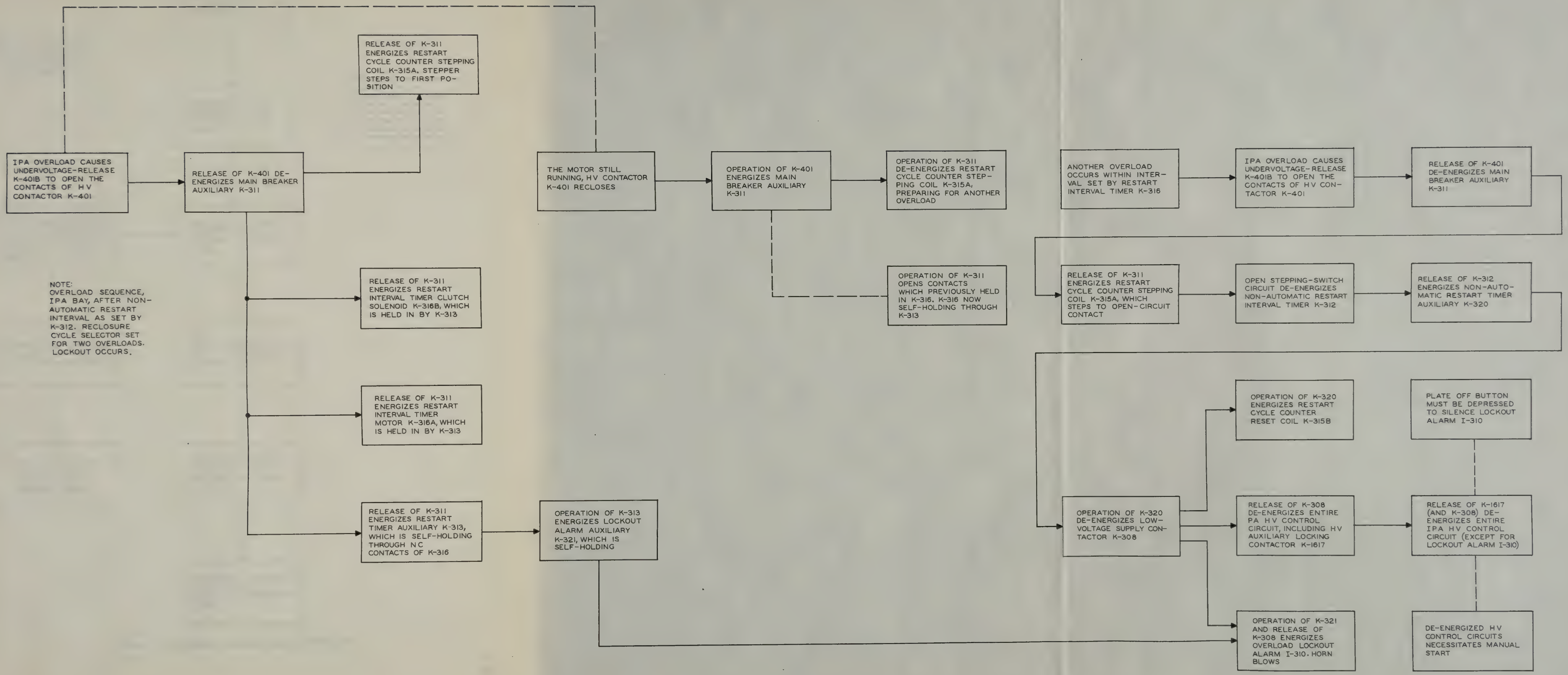


Figure 133. Normal Overload and Lockout Cycle, Block Diagram.

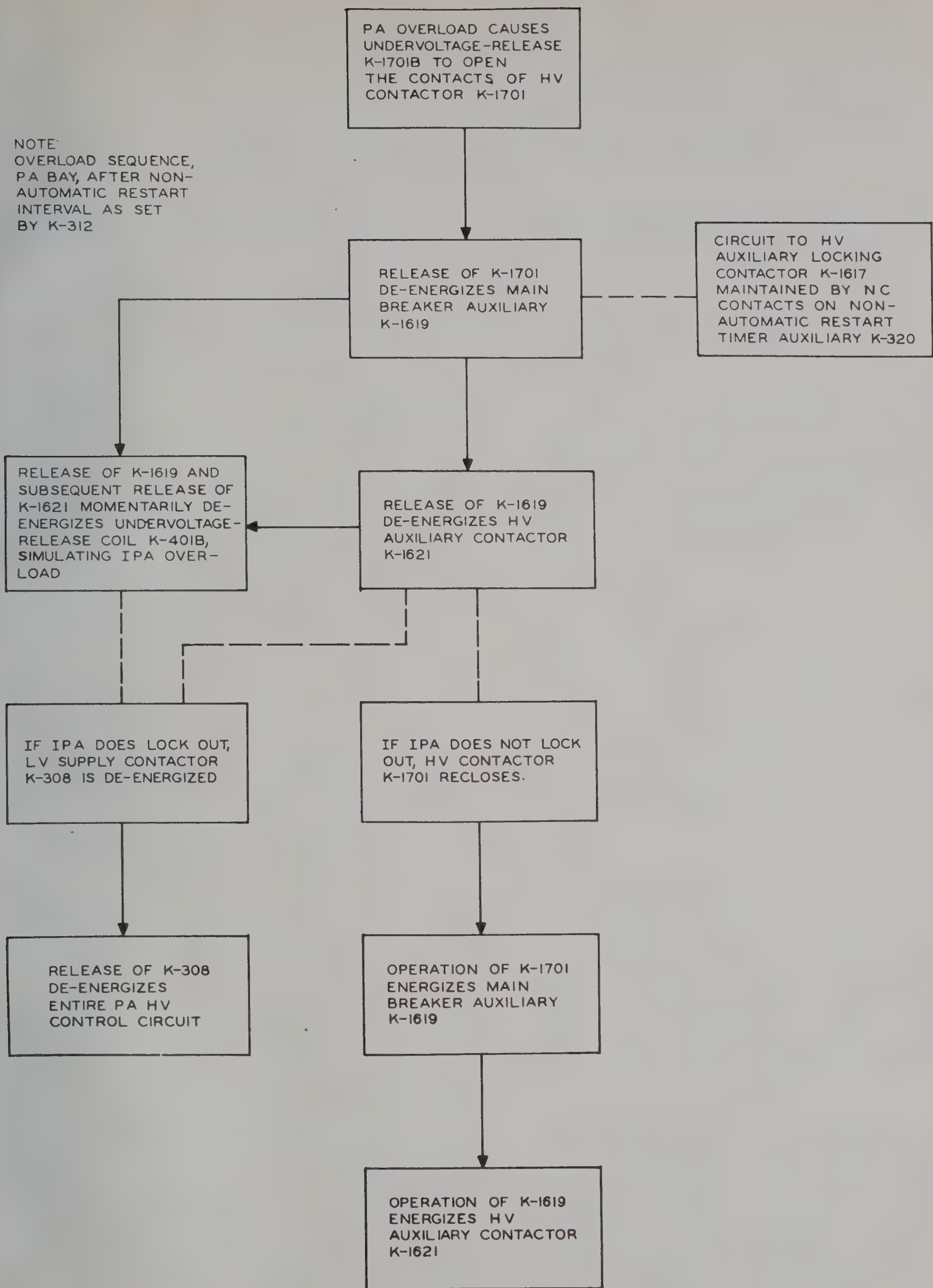


Figure 134. PA Normal Overload Cycle, Block Diagram.

CHAPTER 5

FIELD MAINTENANCE INSTRUCTIONS

Note. The amount of repair that can be performed by units having field maintenance responsibility is limited only by the tools and test equipment available and by the skill of the repairman.

Section I. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

Warning: Operation of this equipment involves the use of high voltages (6000 volts) which are dangerous to life. Observe safety regulations at all times. Do not change tubes or make adjustments inside equipment with high voltage on. Do not depend on door interlock switches for protection, but always throw the FILAMENT - EMERGENCY SHUT DOWN switch to the OFF position. Under no circumstances should interlocks be short-circuited, removed, or tampered with, unless servicing is required for those particular parts. To avoid injury always ground circuits before touching them. Do not service alone.

58. Trouble-Shooting Procedures

The first step in servicing defective equipment is to sectionalize the fault. Sectionalization is the process of tracing the fault to the major component or circuit responsible for the abnormal operation of the set. The second step is to localize the fault; trace the fault to the defective part responsible for the abnormal condition. Some faults, such as burned out resistors, r-f arcing, and shorted transformers, can often be located by sight, smell, or hearing. The majority of faults, however, must be localized by checking voltage and resistance.

a. In servicing the equipment, defective components causing inoperation should be localized as quickly and efficiently as possible. It is suggested that the procedure used in shooting trouble be as follows: Observe all meters and note abnormal readings; observe status lights on upper front doors. Also, note any other indications that may help to isolate the stage at fault. For example, assume that all indications are normal through the second frequency multiplier stage. The transmitter is operating on a frequency of 18 mc. The second frequency multiplier cathode meter reads "0". It can be assumed that the trouble lies somewhere in the second frequency multiplier stage or in the power supply connected with it.

b. Check accessible components such as vacuum tubes, which are a major source of trouble, before proceeding with more intricate servicing. If it is determined that the tubes are not at fault, the defective circuit and its associated components should be checked systematically for defective resistors, short-circuited capacitors, loose connections, etc. Test equipment such as volt-ohmmeters or vacuum-tube voltmeters should be used for these tests.

c. When performing circuit continuity checks or resistance measurements, take into account other components which may be in shunt with the part under test. For accurate results, disconnect one lead of the part being checked before proceeding with measurements. Manually close contacts which are normally closed when the transmitter is operating. This will prevent errors occurring in continuity checks. Make full use of all schematic diagrams and troubleshooting charts contained in this chapter.

Note. If a schematic diagram is entitled "Simplified," those circuit details not essential to an understanding of the theory of the circuit are omitted, and their presence is not indicated in any way. Therefore, do not use simplified schematic diagrams in trouble shooting the equipment, as the presence of components not shown in these diagrams may lead to confusion. Complete schematic diagrams are supplied for use in trouble shooting the equipment, and are located in the back of this book.

d. Use figures 120 and 121 in trouble shooting the preset tuning control circuits. These figures show the sequence of relay operation for the IPA and the PA tuning control circuits, respectively. The arrows indicate casual relations between relay operations, and time sequence is indicated by the direction of flow. That is, one relay acting on another is indicated by a line and arrow; and the time-sequence of events proceeds from left to right.

e. Use figures 235 and 236 in trouble shooting the power control circuits. These figures show the functional relations among the various relays and contactors which control the application of primary power throughout the transmitter. In these diagrams, the relay coils are represented by rectangles. The contacts operated by these coils are arranged in vertical columns beneath the respective rectangles.

(1) In each figure, the power source is represented by a heavy vertical line at the left of the diagram, and the various power supplies and filament transformers fed by the power control circuits are represented by smaller rectangles at the lower right of the diagram.

(2) Power is fed to the supplies and to the relay coils through contacts of the various relays. In the interest of simplicity, the entire set of relay contacts which controls the application of power to a particular circuit is shown for each relay as a single set of contacts. In some cases, the return circuit for a particular relay coil is through the door interlock circuit, so that these interlocks must be closed and the control circuit breaker must be closed before the relay can be energized. The interlock circuits are shown at the upper right of each diagram.

(3) The arrow heads at junction points indicate the direction from the power source. To locate a faulty relay causing inoperation of a power supply or some other relay or set of relays, trace toward the power source from the affected circuit or relay through the series of relay contacts which control the application of power to that circuit. When the faulty relay is located, refer to the main schematic diagram for details of the circuit which controls that relay.

59. Trouble-Shooting Data

This paragraph provides a quick reference to the information in this book which may assist in trouble shooting the equipment. All pertinent text material and illustrations regarding each of the units and subassemblies which make up the transmitting set are listed here.

a. Radio Transmitter T-454/FRT-26.

Component	Fig.	Par.	Description
(1) R-F Oscillator O-91/FRT-5	14		AN/FRT-22 Installation Drawing
	26		R-F Oscillator O-91/FRT-5 Controls
	59		Lubrication of Dial Gears, R-F Oscillator O-91/FRT-5
	92		R-F Oscillator O-91/FRT-5, Block Diagram
	93		R-F Oscillator O-91/FRT-5, Master Oscillator Schematic Diagram
	94		R-F Oscillator O-91/FRT-5, Multipliers and Final Amplifier, Schematic Diagram
	95		R-F Oscillator O-91/FRT-5, Crystal Oscillator, Dividers and Amplifiers, Schematic Diagram
	96		R-F Oscillator O-91/FRT-5, Harmonic Amplifiers and I-F Amplifiers and Mixers, Schematic Diagram
	97		R-F Oscillator O-91/FRT-5, Interpolation Oscillator, Schematic Diagram
	98		R-F Oscillator O-91/FRT-5, Buffer and Interpolation Divider, Schematic Diagram
	99		R-F Oscillator O-91/FRT-5, Motor Control Circuit, Schematic Diagram
	100		R-F Oscillator O-91/FRT-5, Power Control Circuit, Schematic Diagram
	101		R-F Oscillator O-91/FRT-5, Typical Frequencies, No Error in Master Oscillator Setting, Block Diagram
	102		R-F Oscillator O-91/FRT-5, Typical Frequencies, 100-Cycle Error in Master Oscillator Setting, Block Diagram
	136		R-F Oscillator O-91/FRT-5, 800-Kc I-F Selectivity Curve

Component	Fig.	Par.	Description
	137		R-F Oscillator O-91/FRT-5, 875-900 Kc I-F Selectivity Curve
	138		R-F Oscillator O-91/FRT-5, Phase-Splitter Phase Relationships
	147.		R-F Oscillator O-91/FRT-5, Top View, Cover Removed
	148		R-F Oscillator O-91/FRT-5, Bottom View, Cover Removed
	149		R-F Oscillator O-91/FRT-5, Bottom View, Parts Not Shown in Figure 148
	150		R-F Oscillator O-91/FRT-5, Rear View
	151		R-F Oscillator O-91/FRT-5, Dial Gears
	238		R-F Oscillator O-91/FRT-5, Complete Schematic Diagram
	239		R-F Oscillator O-91/FRT-5, Wiring Diagram
		11b(13)	Installation
		14b.	Controls
		18.	Operation
		31a(8)	Initial Adjustments
		51a.	Equipment Performance Checklist
		53b.	Theory
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		65a.	Relay Maintenance
		67.	Alignment Procedure
(2) R-F Oscillator O-270/FRT-26	14		AN/FRT-22 Installation Drawing
	27		R-F Oscillator O-270/FRT-26 Controls
	62		Lubrication of Crystal Selector Autopositioner, R-F Oscillator O-270/FRT-26
	91		R-F Oscillator O-270/FRT-26, Schematic Diagram
	118		Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Simplified Schematic Diagram
	120		Radio Transmitter T-454/FRT-26, Preset Tuning Control Sequence of Operation, Block Diagram
	144		R-F Oscillator O-270/FRT-26, Front View, Cover Open
	145		R-F Oscillator O-270/FRT-26, Top View, Covers Removed
	146		R-F Oscillator O-270/FRT-26, Rear View, Covers Removed
	237		R-F Oscillator O-270/FRT-26, Complete Schematic Diagram
	245		Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Complete Schematic Diagram
	246		Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Wiring Diagram
	247		Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
		11b (9)	Installation
		14c.	Controls
		17.	Operation
		31a (6)	Initial Adjustments
		51e.	Equipment Performance Checklist
		53a.	Theory

Component	Fig.	Par.	Description
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
(3) Frequency-Shift Keyer KY-45/FRT-5	14		AN/FRT-22 Installation Drawing
	25		Frequency-Shift Keyer KY-45/FRT-5 Controls
	60		Lubrication of Dial Gears, Frequency-Shift Keyer KY-45/FRT-5
	103		Frequency-Shift Keyer KY-45/FRT-5, Block Diagram
	104		Frequency-Shift Keyer KY-45/FRT-5, Buffer and Power Amplifier, Schematic Diagram
	105		Frequency-Shift Keyer KY-45/FRT-5, Balanced Modulator and Phase Inverter, Schematic Diagram
	106		Frequency-Shift Keyer KY-45/FRT-5, 200-Kc Oscillator, Balanced Keyer, and Phase-Shifting Amplifiers, Schematic Diagram
	107		Frequency-Shift Keyer KY-45/FRT-5, Vector Diagrams
	108		Frequency-Shift Keyer KY-45/FRT-5, Limiters and Wave-Shaping Filter, Schematic Diagram
	109		Frequency-Shift Keyer KY-45/FRT-5, Phase-Modulation Oscillator, Schematic Diagram
	139		Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Connections to Display Frequency-Shift Patterns
	140		Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Connections to Display Waveform of Input Signals
	141		Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Connections to Display Phase-Modulation Patterns
	142		Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Connections to Display R-F Signal Output
	143		Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Patterns of Signal Bias
	152		Frequency-Shift Keyer KY-45/FRT-5, Front View, Panel Open
	153		Frequency-Shift Keyer KY-45/FRT-5, Rear View
	154		Frequency-Shift Keyer KY-45/FRT-5, Top View, Cover Removed
	155		Frequency-Shift Keyer KY-45/FRT-5, Bottom View, Cover Removed
	156		Frequency-Shift Keyer KY-45/FRT-5, Plate Circuit Coil Enclosure, Cover Removed
	157		Frequency-Shift Keyer KY-45/FRT-5, Oven Assembly, Top View
	158		Frequency-Shift Keyer KY-45/FRT-5, Oven Assembly, Bottom View
	240		Frequency-Shift Keyer KY-45/FRT-5, Complete Schematic Diagram
	241		Frequency-Shift Keyer KY-45/FRT-5, Wiring Diagram
		11b (14)	Installation
		14a.	Controls
		19.	Operation
		31a (9)	Initial Adjustments
		51b.	Equipment Performance Checklist
		53c.	Theory

Component	Fig.	Par.	Description
		63a. 63b. 63c.	Failure Chart Resistance Measurements Voltage Measurements
(4) Power Supply PP-454/FRT-5	14 28 159 160 161 242 243	 11b (12) 14d. 51a. 53d. 63a. 63b. 63c.	AN/FRT-22 Installation Drawing Power Supply PP-454/FRT-5 Controls Power Supply PP-454/FRT-5, Top View Power Supply PP-454/FRT-5, Rear View Power Supply PP-454/FRT-5, Bottom View Power Supply PP-454/FRT-5, Complete Schematic Diagram Power Supply PP-454/FRT-5, Wiring Diagram Installation Controls Equipment Performance Checklist Theory Failure Chart Resistance Measurements Voltage Measurements
(5) Servo amplifiers	117 118 120 162 163 164 251	 11b (11) 31a (5) (a) 51d. 54d (1) 63a. 63b. 63c. 65a.	Servo Control System, Simplified Schematic Diagram Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Simplified Schematic Diagram Radio Transmitter T-454/FRT-26, Preset Tuning Control Sequence of Operation, Block Diagram Radio Transmitter T-454/FRT-26, Servo Amplifier Enclosure, Rear View, Cover Removed Servo Amplifier, Left-Side View Servo Amplifier, Right-Side View Servo Amplifier, Complete Schematic Diagram Installation Initial Adjustments Equipment Performance Checklist Theory Failure Chart Resistance Measurements Voltage Measurements Relay Maintenance
(6) Servo power supply	118 165 166 245 252	 11b (10) 51d. 54d (1) (f) 63a.	Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Simplified Schematic Diagram Servo Power Supply, Front View, Cover Open Servo Power Supply, Rear View Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Complete Schematic Diagram Servo Power Supply, Complete Schematic Diagram Installation Equipment Performance Checklist Theory Failure Chart
(7) Patch panel	14 18 19 24 244		AN/FRT-22 Installation Drawing Patch panel Equipment Rack, Radio Transmitter T-454/FRT-26 Intercabinet Cabling Diagram Radio Transmitter T-454/FRT-26, Patch Panel, Outline Drawing

Component	Fig.	Par.	Description
(8) Electronic keyer	111		Radio Transmitter T-454/FRT-26, Electronic Keyer, Schematic Diagram
	112		Radio Transmitter T-454/FRT-26, Electronic Keyer, Test Keying Circuit Schematic Diagram
	176		Radio Transmitter T-454/FRT-26, Electronic Keyer
	188		Radio Transmitter T-454/FRT-26, Components Behind Electronic Keyer, Detail Rear View
	255		Radio Transmitter T-454/FRT-26, Wiring Diagram
	256		Radio Transmitter T-454/FRT-26, Cabling Schematic
	266		Radio Transmitting Set AN/FRT-22, Main Schematic Diagram
		12b.	Keying line
		14f.	Controls
		51e.	Equipment Performance Checklist
		54b (2)	Theory
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		69m.	Adjustment
(9) Preset tuning control system	33		Preset Tuning Control Panel, Radio Transmitter T-454/FRT-26 controls
	61		Lubrication of Channel-Selecting Autopositioner
	62		Lubrication of Crystal-Selector Autopositioner, R-F Oscillator O-270/FRT-26
	63		Lubrication of Servo Drive Unit
	70		Lubrication of IPA Coupling Network Shorting Drive Unit
	118		Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Simplified Schematic Diagram
	120		Radio Transmitter T-454/FRT-26, Preset Tuning Control Sequence of Operation, Block Diagram
	145		R-F Oscillator O-270/FRT-26, Top View Covers Removed
	146		R-F Oscillator O-270/FRT-26, Rear View, Covers Removed
	168		Typical Servo Drive Unit
	169		Radio Transmitter T-454/FRT-26, Preset Tuning Control Panel, Rear View
	171		Radio Transmitter T-454/FRT-26, Preset Tuning Control Subpanel
	195		Radio Transmitter T-454/FRT-26, IPA Coupling Network, Shorting Switch Drive Unit
	237		R-F Oscillator O-270/FRT-26, Complete Schematic Diagram
	245		Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Complete Schematic Diagram
	246		Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Wiring Diagram
	247		Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Cabling Schematic Diagram
	253		Servo Drive Units Z-507 and Z-508, Complete Schematic Diagram

Component	Fig.	Par.	Description
	254		Servo Drive Units Z-509, Z-510, Z-511, and Z-1510, Complete Schematic Diagram
	255		Radio Transmitter T-454/FRT-26, Wiring Diagram
	256		Radio Transmitter T-454/FRT-26, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22, Main Schematic Diagram
		14f.	Controls
		22.	Operation
		51d.	Equipment Performance
		54b (2)	Electronic Keyer - Theory
		54d (1)	Servo Tuning System - Theory
		55.	Theory
		58d.	Trouble Shooting
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		65a.	Relay Maintenance
		65d.	Servo Motor Brakes
(10) Buffer, multipliers and driver	64		Lubrication of 1st Multiplier Plate Tank Drive Gears
	65		Lubrication of 2nd Multiplier Plate Tank Drive Gears
	110		Radio Transmitter T-454/FRT-26, Buffer Multipliers, and Driver, Schematic Diagram
	179		Radio Transmitter T-454/FRT-26, Buffer, Multiplier, and Driver Unit, Left-Side View
	180		Radio Transmitter T-454/FRT-26, Buffer, Multiplier, and Driver Unit, Right-Side View
	181		Radio Transmitter T-454/FRT-26, Buffer, Multiplier, and Driver Unit, Rear View
	182		Radio Transmitter T-454/FRT-26, Buffer Multiplier, and Driver Unit, Bottom View
	255		Radio Transmitter T-454/FRT-26, Wiring Diagram
	256		Radio Transmitter T-454/FRT-26, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
		17.	Operation
		31a (5)	Initial Adjustments
		49c.	Trouble Shooting
		51e.	Equipment Performance Checklist
		54b (1)	Theory-Buffer and Multipliers
		54b (3)	Theory - Driver
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		69c.	1st Multiplier Adjustment
		69d.	2nd Multiplier Adjustment
		69n.	Tuning for Neutralization
		69o.	Driver Neutralization
(11) Intermediate power amplifier	16		Radio Transmitter T-454/FRT-26, Showing Coupling Platform in Place
	17		IPA Coupling Network Drive and Chain
	51		Radio Transmitter T-454/FRT-26, Doors Open, Grid Shield Removed
	54		Radio Transmitter T-454/FRT-26, Showing SSB Coupling Links in Place

Component	Fig.	Par.	Description
	66		Lubrication of IPA Grid Box Gears and Variable Inductor
	67		Lubrication of IPA Plate Tank Drive Assembly
	68		Lubrication of IPA Shorting Bar Guides
	69		Lubrication of Plate Tank Drum Assembly
	70		Lubrication of IPA Coupling Network Shorting Drive Unit
	71		Lubrication of IPA Coupling Network, Top View
	72		Lubrication of IPA Coupling Network, Bottom View
	73		Lubrication of Coupling Network Drive and Chain
	74		Lubrication of IPA Plate Tank Sliding Contact Assembly
	75		Lubrication of IPA Coupling Network Sliding Contact Assembly
	113		Radio Transmitter T-454/FRT-26, Coupling Circuit, Driver to Intermediate Power Amplifier, Simplified Schematic Diagram
	114		Radio Transmitter T-454/FRT-26, Intermediate Power Amplifier Stage, Schematic Diagram
	115		Radio Transmitter T-454/FRT-26, Single-Sideband Input Circuit, Schematic Diagram
	173		Vacuum-Tube Voltmeters Z-513, Z-514, Z-1505, and Z-1506
	174		Vacuum-Tube Voltmeters Z-515, Z-516, Z-1507, and Z-1508
	175		Antenna Current Meters
	183		Radio Transmitter T-454/FRT-26, Grid Box, Panel Open, Cover Removed
	184		Radio Transmitter T-454/FRT-26, Intermediate Power Amplifier Stage, Front View
	185		Radio Transmitter T-454/FRT-26, Intermediate Power Amplifier Stage, Rear View
	189		Radio Transmitter T-454/FRT-26, IPA Plate Tank Driver Assembly, Top View
	190		Radio Transmitter T-454/FRT-26, IPA Plate Tank Drive Assembly, Bottom View
	191		Radio Transmitter T-454/FRT-26, IPA Plate Tank Sliding Contact Assembly
	192		Radio Transmitter T-454/FRT-26, IPA Coupling Network, Top View
	193		Radio Transmitter T-454/FRT-26, IPA Coupling Network, Bottom View
	194		Radio Transmitter T-454/FRT-26, IPA Coupling Network Sliding Contact Assembly
	195		Radio Transmitter T-454/FRT-26, IPA Coupling Network, Shorting Switch Drive Unit
	255		Radio Transmitter T-454/FRT-26, Wiring Diagram
	256		Radio Transmitter T-454/FRT-26, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
		11b.	Installation
		14f.	Controls
		17.	Operation
		20.	Single-Sideband Operation
		31a (5)	Initial Adjustments

Component	Fig.	Par.	Description
		34.	Single-Sideband Modification
		49c.	Trouble Shooting
		51e.	Equipment Performance
		54b (3) (b)	Theory - Coupling Circuit
		54b (4)	Theory
		54b (5)	Theory - SSB Modification
		54b (6)	Theory - Output Coupling Network
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		64c.	Vacuum Capacitor Maintenance
		64e.	Coil Maintenance
		64f.	Chain Repair
		64g.	Antenna Current Meter Switch Repair
		64m.	Removal of IPA Tubes
		69e.	Driver Plate Tuning Adjustment
		69f.	IPA Plate Tuning Adjustment
		69g.	IPA Coupling Network Adjustment
		69n.	Tuning for Neutralization
		69p.	IPA Neutralization
		69q.	50-mc Parasitic Suppressor Adjustment
		69r.	Vacuum-Tube Voltmeter Adjustment

b. R-F Amplifier AM-738/FRT-22.

Component	Fig.	Par.	Description
(1) Servo amplifiers	117		Servo Control System, Simplified Schematic Diagram
	119		R-F Amplifier AM-738/FRT-22, Preset Tuning Control Circuits, Simplified Schematic Diagram
	121		R-F Amplifier AM-738/FRT-22, Preset Tuning Control Sequence of Operation, Block Diagram
	163		Servo Amplifier, Left-Side View
	164		Servo Amplifier, Right-Side View
	167		R-F Amplifier AM-738/FRT-22, Servo Amplifier Enclosure, Rear View, Cover Removed
	251		Servo Amplifier, Complete Schematic Diagram
		11d (10)	Installation
		31b (5)	Initial Adjustments
		51d.	Equipment Performance Checklist
		54d (1)	Theory
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		65a.	Relay Maintenance
(2) Servo power supply			See a (6) preceding
(3) Preset tuning control system	36		Preset Tuning Control Panel, R-F Amplifier AM-738/FRT-22 Controls
	61		Lubrication of Channel-Selecting Autopositioner
	63		Lubrication of Servo Drive Unit
	77		Lubrication of PA Input Capacity Drive Unit
	78		Lubrication of PA Plate Tank Shorting Drive Unit
	119		R-F Amplifier AM-738/FRT-22, Preset Tuning Control Circuits, Simplified Schematic Diagram

Component	Fig.	Par.	Description
	121		R-F Amplifier AM-738/FRT-22, Preset Tuning Control Sequence of Operation, Block Diagram
	168		Typical Servo Drive Unit
	170		R-F Amplifier AM-738/FRT-22, Preset Tuning Control Panel, Rear View
	172		R-F Amplifier AM-738/FRT-22, Preset Tuning Control Subpanel
	202		R-F Amplifier AM-738/FRT-22, PA Input Capacity Drive Unit
	207		R-F Amplifier AM-738/FRT-22, PA Plate Tank Shorting Drive Unit
	248		R-F Amplifier AM-738/FRT-22, Preset Tuning Control Circuits, Complete Schematic Diagram
	249		R-F Amplifier AM-738/FRT-22, Preset Tuning Control Circuits, Wiring Diagram
	250		R-F Amplifier AM-738/FRT-22, Preset Tuning Control Circuits, Cabling Schematic Diagram
	254		Servo Drive Units Z-509, Z-510, Z-511, and Z-1510, Complete Schematic Diagram
	257		R-F Amplifier AM-738/FRT-22, Wiring Diagram
	258		R-F Amplifier AM-738/FRT-22, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
		14g.	Controls
		22.	Operation
		51d.	Equipment Performance Checklist
		55.	Theory
		58d.	Trouble Shooting
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		65a.	Relay Maintenance
		65d.	Servo Motor Brakes
(4) Power amplifier	21		Raising or Lowering Power Amplifier Tubes
	22		Installing PA Tubes on Platform
	23		Antenna Coupling Network Drive and Chain
	69		Lubrication of Plate Tank Drum Assembly
	73		Lubrication of Coupling Network Platform Drive and Chain
	76		Lubrication of PA Input Capacity Drive Gears
	77		Lubrication of PA Input Capacity Drive Unit
	78		Lubrication of PA Plate Tank Shorting Drive Unit
	79		Lubrication of PA Plate Tank Drive Assembly and Shorting Bar Guides
	80		Lubrication of PA Plate Tank Drive Assembly, Bottom View
	81		Lubrication of Antenna Coupling Network, Bottom View
	82		Lubrication of Antenna Coupling Network, Left-Side-View
	83		Lubrication of PA Plate Tank Sliding Contact Assembly
	84		Lubrication of Antenna Coupling Network Sliding Contact Assembly
	85		Lubrication of Antenna Contact Rods

Component	Fig.	Par.	Description
	116		R-F Amplifier AM-738/FRT-22, Power Amplifier Stage, Schematic Diagram
	173		Vacuum-Tube Voltmeters Z-513, Z-514, Z-1505, and Z-1506
	174		Vacuum-Tube Voltmeters Z-515, Z-516, Z-1507, and Z-1508
	175		Antenna Current Meters
	198		R-F Amplifier AM-738/FRT-22, Power Amplifier Stage, Tubes Removed, Front View
	199		R-F Amplifier AM-738/FRT-22, Power Amplifier Tubes, Front View
	200		R-F Amplifier AM-738/FRT-22, Cathode Compartment
	201		R-F Amplifier AM-738/FRT-22, Plenum Chamber and PA Filament Transformers, Covers Removed, Front View
	202		R-F Amplifier AM-738/FRT-22, PA Input Capacity Drive Unit
	203		R-F Amplifier AM-738/FRT-22, Power Amplifier Stage, Rear View
	206		R-F Amplifier AM-738/FRT-22, PA Plate Tank Drive Assembly, Bottom View
	207		R-F Amplifier AM-738/FRT-22, PA Plate Tank Shorting Drive Unit
	208		R-F Amplifier AM-738/FRT-22, PA Plate Tank Sliding Contact Assembly
	209		R-F Amplifier AM-738/FRT-22, Antenna Coupling Network, Top View
	210		R-F Amplifier AM-738/FRT-22, Antenna Coupling Network, Left-Side View
	211		R-F Amplifier AM-738/FRT-22, Antenna Coupling Network, Bottom View
	212		R-F Amplifier AM-738/FRT-22, Antenna Coupling Network Sliding Contact Assembly
	257		R-F Amplifier AM-738/FRT-22, Wiring Diagram
	258		R-F Amplifier AM-738/FRT-22, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
		11d.	Installation
		14g.	Controls
		17.	Operation
		20.	Single-Sideband Operation
		31b(5)	Initial Adjustments
		34.	Single-Sideband Modification
		49c.	Trouble Shooting
		51e.	Equipment Performance Checklist
		54c.	Theory
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		64c.	Vacuum Capacitor Maintenance
		64e.	Coil Maintenance
		64f.	Chain Repair
		64g.	Antenna Current Meter Switch Repair
		64n.	Removal of PA Tubes
		69h.	PA Plate Tuning Adjustment
		69i.	Antenna Network Adjustment
		69r.	Vacuum-Tube Voltmeter Adjustment

c. Power Supply Assembly PP-1088/FRT-26.

Component	Fig.	Par.	Description
(1) Control circuits	29		Upper Front Panel, Power Supply Assembly PP-1088/FRT-26 Controls
	30		Lower Control Panel, Power Supply Assembly PP-1088/FRT-26 Controls
	31		Upper Control Panel, Radio Transmitter T-454/FRT-26 Controls
	52		Relay Panel, Power Supply Assembly PP-1088/FRT-26
	88		Lubrication of Main Breakers K-401 and K-1701
	129		Normal Starting Sequence, Block Diagram
	130		IPA Overload Sequence, Within Non-Automatic Restart Interval, Block Diagram
	132		Normal Overload and Restart Cycle, Block Diagram
	133		Normal Overload and Lockout Cycle, Block Diagram
	135		Main Breaker, K-401 or K-1701, Covers Removed
	177		Radio Transmitter T-454/FRT-26, Upper Front Panel, Rear View
	213		Power Supply Assembly PP-1088/FRT-26, Upper Front Panel, Rear View
	214		Power Supply Assembly PP-1088/FRT-26, Lower Control Panel, Rear View
	225		Power Supply Control C-1402/FRT-26, Door Open
	234		Westinghouse Motor-Operated De-Ion Circuit Breaker, Outline Drawing
	235		IPA Primary Power Control Functional Block Diagram
	259		Power Supply Assembly PP-1088/FRT-26, Wiring Diagram
	260		Power Supply Assembly PP-1088/FRT-26, Cabling Schematic Diagram
	264		Power Supply Control C-1402/FRT-26, Wiring Diagram
	266		Radio Transmitting Set AN/FRT-22, Main Schematic Diagram
		14e.	Controls
		17.	Operation
		31a.	Initial Adjustments
		49d.	Trouble Shooting
		51c.	Equipment Performance Checklist
		56c(3)(f)	Theory - High-Voltage Control
		57a.	Theory
		58e.	Trouble Shooting
		63a.	Failure Chart
		64d.	Relay Maintenance
		64h.	Main Circuit Breaker Maintenance
		64i.	Replacement of Fuses
		65a.	Relay Maintenance
		65b.	Main Circuit Breaker Maintenance
		69j.	Control Circuit Checkout
		69l.	Timing Relay Adjustment
(2) Low-voltage supply	125		Power Supply Assembly PP-1088/FRT-26, Low-Voltage Supply, Schematic Diagram
	215		Power Supply Assembly PP-1088/FRT-26, Rectifier Compartment
	218		Power Supply Assembly PP-1088/FRT-26, Right-Side Cabinet Wall, Rear View

Component	Fig.	Par.	Description
	259		Power Supply Assembly PP-1088/FRT-26, Wiring Diagram
	260		Power Supply Assembly PP-1088/FRT-26, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
		11a.	Installation
		14e.	Controls
		31a.	Initial Adjustments
		49b.	Trouble Shooting
		51e.	Equipment Performance Checklist
		56c(2)	Theory
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		64k.	Vacuum-Tube Maintenance
		64l(2)	Vacuum Tube Replacement
(3) High-voltage supply	126		Power Supply Assembly PP-1088/FRT-26, High-Voltage Supply, Schematic Diagram
	215		Power Supply Assembly PP-1088/FRT-26, Rectifier Compartment
	216		Power Supply Assembly PP-1088/FRT-26, Upper Left-Side Cabinet Wall, Rear View
	217		Power Supply Assembly PP-1088/FRT-26, Lower Left-Side Cabinet Wall, Rear View
	218		Power Supply Assembly PP-1088/FRT-26, Right-Side Cabinet Wall, Rear View
	259		Power Supply Assembly PP-1088/FRT-26, Wiring Diagram
	260		Power Supply Assembly PP-1088/FRT-26, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
		11a.	Installation
		14e.	Controls
		31a.	Initial Adjustments
		49b.	Trouble Shooting
		51e.	Equipment Performance Checklist
		56c(3)	Theory
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		64k.	Vacuum-Tube Maintenance
		64l(2)	Vacuum-Tube Replacement
(4) Bias supply	124		Power Supply Assembly PP-1088/FRT-26, Bias Supply, Schematic Diagram
	215		Power Supply Assembly PP-1088/FRT-26, Rectifier Compartment
	217		Power Supply Assembly PP-1088/FRT-26, Lower Left-Side Cabinet Wall, Rear View
	218		Power Supply Assembly PP-1088/FRT-26, Right-Side Cabinet Wall, Rear View
	259		Power Supply Assembly PP-1088/FRT-26, Wiring Diagram
	260		Power Supply Assembly PP-1088/FRT-26, Cabling Schematic Diagram

c. Power Supply Assembly PP-1088/FRT-26. (contd)

Component	Fig.	Par.	Description
	266		Radio Transmitting Set AN/FRT-22, Main Schematic Diagram
		11a.	Installation
		14e.	Controls
		31a.	Initial Adjustments
		49b.	Trouble Shooting
		51e.	Equipment Performance Checklist
		56c(1)	Theory
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		64k.	Vacuum-Tube Maintenance
		64l(2)	Vacuum-Tube Replacement
(5) Voltage regulator	89		Lubrication of Powerstat Gears
	122		Power Supply Assembly PP-1088/FRT-26, Primary Voltage Regulating Circuit, Schematic Diagram
	123		Power Supply Assembly PP-1088/FRT-26, Primary Voltage Regulating Circuit, Thyratron Control Circuit, Schematic Diagram
	216		Power Supply Assembly PP-1088/FRT-26, Upper Left-Side Cabinet Wall, Rear View
	217		Power Supply Assembly PP-1088/FRT-26, Lower Left-Side Cabinet Wall, Rear View
	227		Power Supply Assembly PP-1088/FRT-26, Thyratron Control Unit, Front View
	228		Power Supply Assembly PP-1088/FRT-26, Thyratron Control Unit, Cover Removed, Rear View
	259		Power Supply Assembly PP-1088/FRT-26, Wiring Diagram
	260		Power Supply Assembly PP-1088/FRT-26, Cabling Schematic Diagram
	263		Power Supply Assembly PP-1088/FRT-26, Thyratron Control Unit Complete Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22, Main Schematic Diagram
		31a(3)(d)	Initial Adjustments
		51c.	Equipment Performance Checklist
		56b.	Theory
		63a.	Failure Chart

d. Power Supply Assembly PP-1089/FRT-22.

Component	Fig.	Par.	Description
(1) Control circuits	34		Upper Control Panel, R-F Amplifier AM-738/FRT-22 Controls
	37		Upper Control Panel, Power Supply Assembly PP-1089/FRT-22 Controls
	38		Lower Control Panel, Power Supply Assembly PP-1089/FRT-22 Controls
	53		Relay Panel, Power Supply Assembly PP-1089/FRT-22
	88		Lubrication of Main Breakers K-401 and K-1701

Components	Fig.	Par.	Description
	129		Normal Starting Sequence, Block Diagram
	131		PA Overload Sequence, Within Non-Automatic Restart Interval, Block Diagram
	132		Normal Overload and Restart Cycle, Block Diagram
	133		Normal Overload and Lockout Cycle, Block Diagram
	134		PA Normal Overload Cycle, Block Diagram
	135		Main Breaker, K-401 or K-1701 Covers Removed
	196		R-F Amplifier AM-738/FRT-22, Upper Front Panel, Rear View
	219		Power Supply Assembly PP-1089/FRT-22, Upper Front Panel, Rear View
	220		Power Supply Assembly PP-1089/FRT-22, Lower Control Panel, Rear View
	229		Power Control C-598/FRT-6, Door Open
	234		Westinghouse Motor-Operated De-Ion Circuit Breaker, Outline Drawing
	236		PA Primary Power Control Functional Block Diagram
	261		Power Supply Assembly PP-1089/FRT-22, Wiring Diagram
	262		Power Supply Assembly PP-1089/FRT-22, Cabling Schematic Diagram
	265		Power Control C-598/FRT-6, Wiring Diagram
	266		Radio Transmitting Set AN/FRT-22, Main Schematic Diagram
		14h.	Controls
		17.	Operation
		31b.	Initial Adjustments
		49d.	Trouble Shooting
		51c.	Equipment Performance Checklist
		57b.	Theory
		58e.	Trouble Shooting
		63a.	Failure Chart
		64d.	Relay Maintenance
		64h.	Main Circuit Breaker Maintenance
		64i.	Replacement of Fuses
		65a.	Relay Maintenance
		65b.	Main Breaker Maintenance
		69j.	Control Circuit Checkout
		69l.	Timing Relay Adjustment
(2) High-voltage supply	128		Power Supply Assembly PP-1089/FRT-22, High-Voltage Supply, Schematic Diagram
	221		Power Supply Assembly PP-1089/FRT-22, Rectifier Compartment
	222		Power Supply Assembly PP-1089/FRT-22, Left-Side Cabinet Wall, Rear View
	223		Power Supply Assembly PP-1089/FRT-22, Right-Side Cabinet Wall, Rear View
	224		Power Supply Assembly PP-1089/FRT-22, Front Cabinet Wall, Rear View
	261		Power Supply Assembly PP-1089/FRT-22, Wiring Diagram
	262		Power Supply Assembly PP-1089/FRT-22, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
		11c.	Installation
		14h.	Controls

d. Power Supply Assembly PP-1089/FRT-22. (contd)

Component	Fig.	Par.	Description
		31b.	Initial Adjustments
		49b.	Trouble Shooting
		51e.	Equipment Performance Checklist
		56d (2)	Theory
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		64k.	Vacuum-Tube Maintenance
		64l (2)	Vacuum-Tube Replacement
(3) Bias supply	127		Power Supply Assembly PP-1089/FRT-22, Bias Supply, Schematic Diagram
	222		Power Supply Assembly PP-1089/FRT-22, Left-Side Cabinet Wall, Rear View
	223		Power Supply Assembly PP-1089/FRT-22, Right-Side Cabinet Wall, Rear View
	224		Power Supply Assembly PP-1089/FRT-22, Front Cabinet Wall, Rear View
	261		Power Supply Assembly PP-1089/FRT-22, Wiring Diagram
	262		Power Supply Assembly PP-1089/FRT-22, Cabling Schematic Diagram
	266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
		11c.	Installation
		14h.	Controls
		31b.	Initial Adjustments
		49b.	Trouble Shooting
		51e.	Equipment Performance Checklist
		56d (1)	Theory
		63a.	Failure Chart
		63b.	Resistance Measurements
		63c.	Voltage Measurements
		64k.	Vacuum-Tube Maintenance
		64l (2)	Vacuum-Tube Replacement

e. Power Supply Control C-1402/FRT-26.

Fig.	Par.	Description
14		AN/FRT-22 Installation Drawing
88		Lubrication of Main Breakers K-401 and K-1701
135		Main Breaker K-401 or K-1701, Covers Removed
225		Power Supply Control C-1402/FRT-26, Door Open
234		Westinghouse Motor-Operated De-Ion Circuit Breaker, Outline Drawing
235		IPA Primary Power Control Functional Block Diagram
264		Power Supply Control C-1402/FRT-26, Wiring Diagram
266		Radio Transmitting Set AN/FRT-22, Main Schematic Diagram
	12a.	External Connections
	31a (4)	Initial Checkout
	49d.	Trouble Shooting
	51c.	Equipment Performance Checklist
	57a (2)	Theory
	58e.	Trouble Shooting
	63a.	Failure Chart
	64d.	Relay Maintenance

Fig.	Par.	Description
	64h.	Main Breaker Maintenance
	64j.	Fuse Replacement
	65a.	Relay Maintenance
	65b.	Main Circuit Breaker Maintenance

f. Power Control C-598/FRT-6.

Fig.	Par.	Description
14		AN/FRT-22 Installation Drawing
88		Lubrication of Main Breakers K-401 and K-1701
229		Power Control C-598/FRT-6, Door Open
234		Westinghouse Motor-Operated De-Ion Circuit Breaker, Outline Drawing
236		PA Primary Power Control Functional Block Diagram
265		Power Control C-598/FRT-6, Wiring Diagram
266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
	12a.	External Connections
	31b (4)	Initial Checkout
	49d.	Trouble Shooting
	51c.	Equipment Performance Checklist
	57b (3)	Theory
	58e.	Trouble Shooting
	63a.	Failure Chart
	64h.	Main Circuit Breaker Maintenance
	64i.	Fuse Replacement
	65b.	Main Circuit Breaker Maintenance

g. Power Transformer TF-196/FRT-26.

Fig.	Par.	Description
14		AN/FRT-22 Installation Drawing
126		Power Supply Assembly PP-1088/FRT-26, High-Voltage Supply, Schematic Diagram
226		Power Transformer TF-196/FRT-26, Cut-away View
266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram

Fig.	Par.	Description
	12a.	External Connections
	31.	Initial Adjustments
	56c (3)	Theory
	63b.	Resistance Measurements
	63c.	Voltage Measurements

h. Power Transformer TF-197/FRT-22.

Fig.	Par.	Description
14		AN/FRT-22 Installation Drawing
89		Lubrication of Powerstat Gears
128		Power Supply Assembly PP-1089/FRT-22, High-Voltage Supply, Schematic Diagram
230		Power Transformer TF-197/FRT-22, Door Open, Front View
231		Power Transformer TF-197/FRT-22, Cover Removed, Rear Cutaway View Showing High-Voltage Terminals
266		Radio Transmitting Set AN/FRT-22 Main Schematic Diagram
	12a.	External Connections
	56d (2)	Theory
	63b.	Resistance Measurements
	63c.	Voltage Measurements

60. Test Equipment Required for Trouble Shooting

The test equipment required for taking resistance and voltage measurements in Radio Transmitting Set AN/FRT-22 is listed below.

a. Weston Model 772 Type 6 meter or equivalent
b. Iron-van meter, 0-10 volt range
c. Hickok type 125 VTVM or equivalent

More extensive trouble shooting procedures may necessitiate the use of instruments not listed above.

61. General Precautions

a. When repairs are necessary it is recommended that servicing be done by competent radio technicians supplied with suitable tools and equipment.

b. When working on the equipment remember that high voltages (6000 volts) may be exposed. Use extreme caution. Do not depend on interlocks.

c. Before proceeding with any extensive repair be reasonably sure that this repair will eliminate the trouble. Do not waste time in needless probing or replacement of parts.

d. In all repairs and replacements, every attempt should be made to duplicate the original condition of the equipment. Standard replacement parts, such as supplied in the spare parts accompanying this equipment, should be used. Particular care should be taken to run any replacement wiring in the same position and manner as the original wiring. Soldering should be done with rosin-core solder only. Use only the smallest amount of solder necessary for a good mechanical and electrical joint. Do not permit excess solder to drop on other components or remain within the chassis.

e. In the event of emergency repairs, where it is impossible to make exact replacement of parts, the temporarily repaired equipment should be conspicuously marked or tagged to indicate the temporary nature of the repair, and restored to its original condition at the first possible opportunity.

62. Checking Filament and B+ Circuits for Short Circuits

Refer to paragraph 63, Trouble-shooting Charts. Resistance measurements on plate pins of tubes give an indication of short circuits in the high-voltage circuits.

63. Trouble-Shooting Charts

The following charts are supplied as an aid in locating trouble in the transmitter. The transmitter failure chart lists the symptoms which the repairman observes while making a few simple tests. Once the trouble has been localized to a stage or circuit, a tube check and voltage and resistance measurements of this stage or circuit should ordinarily be sufficient to isolate the defective part. Normal resistance and voltage measurements are given in b. and c. following.

a. Transmitter Failure Chart.

Symptom	Probable Cause	Correction
1. Operation of a primary-power control circuit breaker fails to energize the associated circuit.	1. Contacts or coils of contactors which control application of primary power are faulty.	1. Refer to paragraph 57, and use the functional block diagrams of the IPA and PA power control circuits (figs. 235 and 236) to locate the faulty contactor.
2. When channel selector switch is operated, preset tuning system fails to complete tuning cycle.	2. A relay or tube in the preset tuning control circuits is faulty. The tube may be weak, or a relay may have dirty contacts or an open coil.	2. Refer to the flow charts for the IPA and PA preset tuning control circuits (figs. 120 and 121) to determine at which step in the operation the system malfunctions. Use the diagrams of the tuning control circuits (figs. 245 through 250) in locating the trouble. It may be necessary to clean the contacts of all the relays associated with these circuits and to check the operation of each relay.
3. Operation of the PLATE ON button fails to energize high-voltage supply.	3. One of the power-control contactors is not functioning. If the high-voltage contactor runs without closing, the motor mounting plate might not be properly centered.	3. Refer to the correction of step 1. Refer to par. 65b. for motor mounting plate adjustment.

Symptom	Probable Cause	Correction
	Overload relay may not be adjusted properly.	Refer to par. 31a (2) for overload relay adjustment.
4. Operation of the test key fails to produce buffer and first multiplier grid current.	4. The electronic keyer may not be adjusted properly.	4. Refer to par. 69m. for adjustment procedure.
	The keyer tube, V-507, may be bad, or some component in the keyer circuit may be bad.	If the tube is good, use the resistance and voltage measurements of par. 63b. and 63c. to locate the faulty component.
	The buffer or multiplier tubes, V-501 or V-502, resp., may be bad, or the buffer may not be receiving drive.	If the buffer and multiplier circuits are in working order, the oscillator in use may not be delivering output to the buffer.
	The oscillator in use may not be patched into the transmitter properly, or the oscillator may be faulty.	If the oscillator in use is connected correctly to the transmitter, the oscillator may not be functioning properly. Refer to the voltage and resistance measurements of par. 63b. and 63c.
5. Insufficient IPA grid current.	5. Tube or component in multiplier-and-driver assembly is faulty.	5. If tubes are good, resistance and voltage measurements will help isolate faulty component.
6. Insufficient PA grid current.	6. IPA tube, V-505 or V-506 faulty. Loading platform not properly adjusted.	6. If tubes are good, refer to par. 69g. for coupling network adjustment procedure.
7. Insufficient antenna current, or PA will not load properly.	7. PA tube may be weak.	7. Check individual cathode currents. If one reading is abnormal, interchange tubes to determine if trouble is in the tube or in associated cathode circuit.
	Cathode circuit component may be faulty.	Make voltage and resistance measurements to check for faulty component.
8. Servo amplifier chatters, or tuning is sluggish.	8. Servo amplifier out of adjustment.	8. Refer to par. 31a (5) for servo adjustment procedure.
	Servo amplifier tube bad, servo amplifier component faulty, or servo drive unit faulty.	Interchange servo amplifier units to determine if amplifier unit is bad or if associated drive unit is faulty.
	Servo power supply may be faulty.	Check voltages at servo power supply. See fig. 245 or 248 for correct voltages.

Symptom	Probable Cause	Correction
	Servo motor brake may be out of adjustment.	Refer to par. 65d. for servo motor brake adjustment procedure.
9. High voltage, low voltage, or bias voltage too low.	9. Rectifier tube faulty.	9. Check each tube in power supply by lifting plate cap and replacing. In this way find tube which makes no difference in power supply output voltage whether in or out of circuit.
10. Recycling circuit, high-voltage step-starter circuit, lock-out alarm circuit, or automatic shutdown circuit inoperative.	10. One of the power control contactors not functioning.	10. See correction of step 1.
11. Primary voltage regulator not functioning.	11. Thyratron control unit Z-302 may be faulty.	11. Repair unit. A tube may be burned out, or a relay may be stuck.
	Powerstat (Z-301) motor may be open.	Repair or replace motor.
	Time-delay relay K-314 or K-317 may be faulty.	Replace relay.
12. Plate currents do not drop to low values when key is up.	12. Not enough bias.	12. Check tubes and components in bias supplies.
	Oscillation occuring.	See par. 69n. through 69p. for neutralization procedures.
13. One or more filaments do not light.	13. The corresponding fuse is blown (fuse indicator lights will glow when fuse is blown).	13. Replace fuse or trouble shoot circuit as necessary.
NOTE: F-401, F-402, F-403, F-404, F-405, F-1701, and F-1702 do not have corresponding blown-fuse indicator lamps.		

b. Resistance Measurements.

(1) *Radio Transmitter T-454/FRT-26.*

CONDITIONS OF MEASUREMENT:

All power removed from the equipment.
All high-voltage shorting switches blocked open.
All resistance measurements taken from the indicated terminal to ground using a Simpson Model 260 meter.
Servo amplifier removed from transmitter.

TUBE	PIN NUMBER									
	1	2	3	4	5	6	7	8	9	CAP
V-501	0	0	0	35K	500	11K	0	4.4K	---	---
V-502	0	200K	45K	450	0	---	---	---	---	4000
V-503	0	22K	30K	5	0	---	---	---	---	2000
V-504	6	3200	6500	3200	6	---	---	---	---	60K
V-505	GRID 280	PLATE 65K	FIL 1 0.6	FIL 2 0.6	---	---	---	---	---	---
V-506	280	65K	0.6	0.6	---	---	---	---	---	---
V-507	14K	190K	680	0	0.1	12K	110K	0	0.1	---
V-508	820K	0	0	0.1	0	5K	0	---	---	---

(2) *R-F Amplifier AM-738/FRT-22.*

TUBE	GRID		PLATE		FIL 1		FIL 2
V-1501	250		40K		0.5		0.5
V-1502	250		40K		0.5		0.5
V-1503	250		40K		0.5		0.5
V-1504	250		40K		0.5		0.5
V-1505	250		40K		0.5		0.5
V-1506	250		40K		0.5		0.5
	1	2	3	4	5	6	7
V-1507	820K	0	0	0.1	0	5K	0

(3) *Power Supply Assembly PP-1088/FRT-26.*

TUBE	PIN NUMBER				
	1	2	3	4	CAP
V-301	INF	INF	INF	INF	2.8
V-302	INF	50K	INF	50K	INF
V-303	INF	INF	INF	INF	2.8
V-304	INF	50K	INF	50K	INF
V-305	INF	INF	INF	INF	2.8
V-306	INF	50K	INF	50K	INF
V-307	4K	INF	INF	4K	27

TUBE	PIN NUMBER				
	1	2	3	4	CAP
V-308	4K	INF	INF	4K	27
V-309	0.1	INF	INF	0.1	500
V-310	0.1	INF	INF	0.1	500

(4) *Power Supply Assembly PP-1089/FRT-22.*

TUBE	PIN NUMBER				
	1	2	3	4	CAP
V-1601	INF	INF	INF	INF	2.5
V-1602	INF	INF	INF	INF	2.5
V-1603	INF	INF	INF	INF	2.5
V-1604	INF	INF	INF	INF	2.5
V-1605	INF	INF	INF	INF	2.5
V-1606	INF	INF	INF	INF	2.5
V-1607	INF	40K	INF	40K	INF
V-1608	INF	40K	INF	40K	INF
V-1609	INF	40K	INF	40K	INF

(4) *Power Supply Assembly PP-1089/FRT-22. (contd)*

TUBE	PIN NUMBER				
	1	2	3	4	CAP
V-1610	INF	40K	INF	40K	INF
V-1611	INF	40K	INF	40K	INF
V-1612	INF	40K	INF	40K	INF

TUBE	PIN NUMBER				
	1	2	3	4	CAP
V-1613	0.2	INF	INF	0.2	400
V-1614	0.2	INF	INF	0.2	400
V-1615	0.2	INF	INF	0.2	400
V-1616	0.2	INF	INF	0.2	400

(5) *Servo amplifier.*

TUBE	PIN NUMBER								
	1	2	3	4	5	6	7	8	9
V-801	2.2meg	136K	36K	0	0	2.2meg	136K	36K	0.1
V-802	90K	2.2meg	0	0	0	90K	2.2meg	0	0.1

(6) *R-f voltmeters.*

TUBE	PIN NUMBER						
	1	2	3	4	5	6	7
V-1301	400K	INF	0	0.1	INF	400K	0

TUBE	PIN NUMBER						
	1	2	3	4	5	6	7
V-1303	280K	INF	0	0.1	INF	280K	0

c. Voltage Measurements.

(1) *R-F Oscillator O-270/FRT-26.*

CONDITIONS OF MEASUREMENT:

230 volts, 60 cycles a-c input.
Circuit breakers SERVO CONTROL, CONTROL CIRCUIT, L.V. & BIAS, LOW LEVEL FILAMENT P.A. FILAMENT, and BLOWER, on Power Supply Assembly PP-1088/FRT-26 in ON position.
Transmitter adjusted for cw emission.
TUNE - OPERATE switch in L.V. TUNE position.
R.F. EXCITATION control set for 8 ma grid current on Driver V-504.
OUTPUT LEVEL control set for -50 volts with all TEST KEY switches open.
All grid voltages taken with a 2-1/2-mh choke in series with the test lead.
All voltage measurements were taken from the terminal indicated to ground with a Weston model 772 type 6 meter unless otherwise indicated.

JAN TUBE TYPE	PIN NUMBER									SYMBOL NUMBER
	1	2	3	4	5	6	7	8	9	
6AK5	1.45	1.45	Note 1 6.3ac	Note 1 6.3ac	146	108	---	---	---	V-1101

JAN TUBE TYPE	PIN NUMBER									SYMBOL NUMBER
	1	2	3	4	5	6	7	8	9	
6AG7	0	Note 1 6.1ac	---	0	8	185	Note 1 6.1ac	185	---	V-1102
VR90	---	0	185	---	92.5	---	185	---	---	V-1103
VR90	---	92.5	185	---	185	---	185	---	---	V-1104

Note 1: a-c heater voltage; measured between proper filament transformer secondary terminals with iron-vane meter.

(2) *Radio Transmitter T-454/FRT-26.*

CONDITIONS OF MEASUREMENT:

230 volts, 60 cycles a-c input.
Circuit breakers SERVO CONTROL, CONTROL CIRCUIT, L.V. & BIAS, LOW LEVEL FILAMENT, P.A. FILAMENT, and BLOWER, on Power Supply Assembly PP-1088/FRT-26 in ON position.
Transmitter adjusted for cw emission.
TUNE - OPERATE switch in OPERATE position.
R.F. EXCITATION control set for 8 ma grid current on Driver V-504.
OUTPUT LEVEL control set for -50 volts with all TEST KEY switches open.
All grid voltages taken with a 2-1/2-mh choke in series with the test lead.
All voltage measurements taken from the terminal indicated to ground with a Weston model 772 type 6 meter unless otherwise indicated.

JAN TUBE TYPE	PIN NUMBER									SYMBOL NUMBER
	1	2	3	4	5	6	7	8	9	
6AG7	---	Note 1 6.1ac	---	-31.8	0.75	211	Note 1 6.1ac	278	---	V-501
807	Note 1 6.4ac	345	- 31.5	0.1	Note 1 6.4ac	---	---	---	CAP 583	V-502
807	Note 1 6.4ac	350	-185	0	Note 1 6.4ac	---	---	---	CAP 480	V-503
4-400A	Note 1 5.1ac	620	-152	370	Note 1 5.1ac	---	---	---	CAP 4600	V-504
3X2500A3	PLATE Note 2 5900		CATHODE 1.25		GRID -620		HEATER Note 1 7.5 ac			V-505 V-506
12AU7	95	---	---	Note 1 6.1ac	Note 1 6.1ac	160	0	1.9	Note 1 6.1ac	V-507

Note 1: ac heater voltage; measured between proper transformer secondary terminals with iron-vane meter.
Note 2: Transmitter panel meters used for measurement.

(3) *R-F Amplifier AM-738/FRT-22.*

CONDITIONS OF MEASUREMENT:

230 volts, 60 cycles a-c input.
Circuit breakers SERVO CONTROL, CONTROL CIRCUIT, L.V. & BIAS, LOW LEVEL FILAMENT, P.A. FILAMENT, and BLOWER, on Power Supply Assembly PP-1088/FRT-26 in ON position.
Circuit breakers SERVO CONTROL, CONTROL CIRCUIT, BIAS, RECT. FILAMENT, P.A. FILAMENT, and BLOWER, on Power Supply Assembly PP-1089/FRT-22 in ON position.
TUNE-OPERATE switch in OPERATE position.
R.F. EXCITATION control set for 8 ma grid current on Driver V-504.
OUTPUT LEVEL control set for -50 volts with all TEST KEY switches open.
All grid voltages taken with a 2-1/2-mh choke in series with the test lead.
All voltage measurements taken from the indicated terminal to ground with a Weston model 772 type 6 meter unless otherwise indicated.

JAN TUBE TYPE	PLATE	CATHODE	GRID	HEATER	SYMBOL NUMBER
3X2500A3	Note 2 5500	0	-350	Note 1 7.5ac	V-1501 V-1502 V-1503 V-1504 V-1505 V-1506
Note 1: ac heater voltage; measured between proper transformer secondary terminals with iron-vane meter. Note 2: Transmitter panel meters used for measurement.					

Section II. REPAIRS

64. Replacement of Parts

a. General. The replacement of majority of components in this equipment requires no special treatment. However, there are a few components which are included in the spare parts and which do require a short explanation. These parts are listed in the parts list with a letter following their symbol designation (for example, K-301A, L-516B, etc.) The following paragraphs explain briefly the procedure for replacement of these particular parts.

b. Blower Assemblies. The spare parts associated with the blowers include extra V-belts, spare motors, and spare sleeve bearings for the impeller shaft. To replace the V-belt, it is necessary to remove the two screws holding one of the bearing assemblies, and slip the bearing off the shaft. To replace one of the blower motors, remove the entire blower assembly from the cabinet. This assembly is taken out by removing the four nuts holding it to the floor of the unit, and slipping the entire assembly out of the cabinet. The motor may then be removed by taking out the four bolts holding it to the blower assembly.

c. Vacuum Capacitors. There are a number of capacitors which have end caps, a lead screw assembly and bearings fastened to them. When replacing one of these parts, take off the end cap, the lead screw assembly, and the bearing. Fasten these components on the replacement part and install in the unit.

d. Relay Contacts and Coils.

(1) The spare parts include spare contacts and coils for nearly all of the relays in the equipment. The relays are similar, and an explanation of the procedure to be followed in replacing the contacts and the coil on one of the relays should suffice for all of them. Relay K-301, for example, has four normally-open contacts mounted on one bakelite strip and three normally-open contacts mounted on another bakelite strip, both strips mounted on the left side of the relay. These bakelite strips are mounted by two screws which extend through the strips into the relay frame. Should the contacts on one of these strips become

damaged to the extent that replacement is necessary, take out the two mounting screws and remove the bakelite strip which mounts the defective contacts. Insert the replacement part in its place and secure it to the relay frame. The center contacts on the relay are held in place by a spring-loading arrangement. They may be removed by twisting a quarter turn in either direction and then lifting upward.

(2) To replace one of the relay coils, first remove the wires which connect to it. Take out the screw on the upper part of the plunger immediately above the core of the coil, and remove the spring from the back of the plunger. This allows the plunger to drop out. Remove the screw located immediately above the relay coil, and slip the coil out. To insert the new coil reverse the procedure given above.

e. Coil Contacts and Shorting Bars. The spare parts include the shorting bar for the intermediate power amplifier plate tank coil, the contact holding assemblies for the power amplifier plate tank coils, and the "U" and "C" shaped coil contacts.

(1) To replace the "U" and "C" shaped contacts (figs. 191 and 194) on either the intermediate power amplifier plate tank or the IPA coupling coils, it is necessary to first remove the shorting bar. This may be done by rotating the bar to the top of the coil and then removing the single screw which holds the shorting bar to the rotating center post. When this is done, rotate the bar the remainder of the distance until it is free of the coil. The "U" shaped contacts are held on by tension and may be pulled off with pliers. The "C" shaped contacts are removed by putting a screwdriver underneath the flange of the contact and prying it off the shorting bar.

Note. If for some reason the chromium plating on these contacts is damaged or broken, this contact may, instead of producing a highly polished contact line, roughen the copper coil surface and thus aggravate sticking. Therefore, the condition of the coil contact surface and the chromium contact spring should be checked often. Any roughening or burring of the copper should immediately be sanded and polished to a smooth surface. Occasionally some of the contact springs have too much arch. This produces too great a clamping action between the top and bottom contacts, and makes it nearly impossible for the driving motor to operate against the load. If this is the case, remove some of the arch from the spring. There should be just enough arch so that the springs fit snugly but not tightly when the cross-bar is in place inside the coil.

(2) The power amplifier plate tank and the antenna-circuit coils do not have shorting bars but have three contact-holding assemblies on each coil. These assemblies are removed by taking out the screws which hold them to the drums. Once the assemblies have been removed from the drums, the removal of the contacts (figs. 208 and 212) is the same as in the above discussion. To insert the new parts, merely reverse the above procedure.

f. Chain Repair. A chain repair kit is provided in the spare parts list. There are two types of chains in the equipment, and the chain repair kits contain material for the repair of both types. To remove a defective link, the heads of the pins holding that link on each end must be ground off. This process may damage the side plates. Extra side plates are supplied. Place new side plates in position and insert the pins. Finally, head the pins.

g. Antenna Meter Switch. Spare stators for S-505, S-506, S-1527, and S-1528 are included in the spare parts. When the stator of any of these switches is in need of repair or replacement, it is removed by taking out the two screws which hold it in place. The new stator is then put in place and secured by means of the same two screws.

h. Main Circuit Breaker Motors and Brushes.

(1) Contained in the spare parts are replacement brushes and replacement motors for the two motor-operated breakers, K-401 and K-1701. To replace the brushes on the motors, unscrew the small black knobs, located on either side of the breaker motor, and remove the defective brush. Insert the replacement brushes, and then replace the knobs.

(2) To replace the motor, first remove the motor mounting plate by taking off the three bolts which mount it. The motor is then easily removed from the mounting plate. When the new motor has been mounted, it will probably be necessary to readjust the breaker in accordance with the procedure given in paragraphs 65b(3) through 65b(3)(c)3.

i. Replacement of Fuses. All fuses in the AN/FRT-22 with the exception of the ones located in Power Supply Control C-1402/FRT-26 (F-401, F-402, F-403, F-404 and F-405) and Power Control C-598/FRT-6 (F-1701 and F-1702) are equipped

with indicator lamps. All other primary circuits are protected by circuit breakers.

Note. Never replace a fuse or a circuit breaker with one of higher rating unless continued operation of the equipment is more important than probable damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause of the trouble has been corrected. If a circuit breaker trips after resetting, do not reset a second time until the cause of trouble has been corrected.

j. Testing Tubes. In the course of shooting trouble in the equipment, it may be necessary to replace a vacuum tube. Before discarding any vacuum tube, the technician should determine without question that replacement will remedy the trouble. The tube should be checked in a standard tube tester or in actual operation and should be discarded only if it shows one of the following faults:

(1) Low emission.
(2) Open filament.
(3) Microphonics.
(4) Shorted element.
(5) Intermittent shorts.
(6) Gassy.

k. Vacuum Tube Maintenance.

(1) For satisfactory tube operation and normal tube life, filament voltages must be correct to within 5% of the rated value. Permitting the tubes to draw current for a longer period than a few seconds while the stage is out of resonance will shorten the life of the tubes.

(2) The type 3B28 and 4B32 rectifier tubes are xenon gas filled. They have the same current and voltage ratings as 866A and 872A tubes and are directly interchangeable. They are considerably more tolerant of ambient temperature variations, and should not be replaced with 866A or 872A tubes except in an emergency.

(3) Eight type 3B28 tubes are used in the low-voltage and bias supplies in the transmitter, and eighteen type 4B32 tubes are used in the two high-voltage plate supplies.

l. Vacuum Tube Replacements.

Note. Allow tubes to cool before handling. If immediate replacement is required, use an asbestos glove, and handle carefully.

(1) Before replacing a vacuum tube note the proper location from the figures at the end of this chapter. When removing octal type vacuum tubes, use a gentle rocking motion. When inserting the replacement tube into the socket, align the tube guide and socket slot; use a steady pressure and push straight downward until the tube is seated properly. Use the same procedure and precautions when removing any four or five-prong tubes.

(2) When removing 3B28 or 4B32 tubes, the tube should be grasped firmly and rotated counterclockwise until the guide pin is in line with the tube socket slot. The tube may then be lifted out of the socket. When inserting a new tube, align the guide pin with the socket slot; push the tube straight down and rotate clockwise until the guide pin is stopped.

m. Removal of Intermediate Power Amplifier Tubes. Removal of an intermediate power amplifier tube calls for considerable caution. When removing these tubes, use the following procedure:

(1) Take the puller supplied for removing the intermediate power amplifier tubes and hook the jaws onto the top of the 3X2500A3 tube. Hook the other end of the tool over the front edge of antenna coupler platform, hold it with the thumb of one hand while the fingers are hooked over the edge of the coupler platform behind the intermediate power amplifier tubes; then push upward on the front end of the wrench.

(2) When the intermediate power amplifier tube is loosened from its socket, remove the puller from the tube. The tube can then be removed by hand.

n. Removal of Power Amplifier Tubes (figs. 21 and 22). Extreme care must be exercised in the removal of the six power amplifier tubes. If they must be changed while they are still hot, take particular care to avoid being burned on the tubes or surrounding parts. Remember that though one tube may be faulty, there may be others that are good and can be replaced in service if they are not damaged during removal. In removing the power amplifier tubes, follow this procedure carefully.

(1) Open the upper front door of R-F Amplifier AM-738/FRT-22 and use a shorting stick to assure that no residual voltage remains on any of the high-voltage components. Reach into the amplifier chamber and grasp the handwheel at the base of the air duct, and turn it counterclockwise. This disengages the tubes from their sockets. Further rotation of the handwheel lowers the tubes and the platform on which they rest so that they are readily accessible. (See fig. 21). Grasp the body of the nearest tube with

one hand, and release the two hold-down clamps with the other. If a clamp tends to stick, slight movement of the tube may help to free it. Now, the tube may be lifted from the platform. Lift the tube straight upward into the socket hole, then tilt it out, bottom first. (See fig. 22).

(2) To replace Power Amplifier Tubes, reverse the above procedure.

65. Disassembly, Cleaning, and Lubrication of Equipment at Field Maintenance Level

a. Relays and Contactors.

(1) Before servicing relay or contactor contacts, clean the exterior with a dry or damp cloth. If the contacts are very dirty, clean with a cloth or brush dipped in carbon tetrachloride. Then wipe the surface with a dry cloth to remove the white deposit left by the solvent when it dries. If inspection shows contacts to be dirty or corroded, they should be removed and cleaned, and then carefully replaced.

(2) Hard alloy contacts are cleaned by drawing a strip of clean wrapping paper between them while holding them together. Corroded, burned or pitted contacts should be dressed with a crocus cloth strip or a burnishing tool.

(3) Solid silver contacts are easily cleaned with a rag or brush dipped in carbon tetrachloride. After being cleaned, the contacts should be polished with a dry cloth. Dress corroded contacts first with crocus cloth, using either a stick or a strip of the material. When all of the corrosion has been removed, wipe with a clean cloth moistened with carbon tetrachloride and polish with a piece of folded cloth. Make certain that the shape of the contact has not been altered. Dress burned or pitted contacts, if necessary, with #0000 sandpaper, making certain that the shape of the contact is not changed. Then smooth the surface with crocus cloth. After a high polish is obtained, wipe thoroughly with clean cloth, using carbon tetrachloride when necessary.

Note. The brown discoloration found on silver and silver-plated contacts is silver oxide and is a good conductor. It should be let alone unless the contacts must be cleaned for some other reason.

(4) Clean silver-plated contacts with a cloth or brush dipped in carbon tetrachloride. After cleaning, polish the contacts with a dry cloth. Crocus cloth may be used to remove pitting or corrosion. The work must be done very carefully so as not to remove an excess amount of silver plating. When all the corrosion has been removed, polish with cloth. Make certain that the shape of the contact has not been changed. Dress contacts after burned or pitted spots are removed. This may require an appreciable amount of time, but is preferable to the use of a file or sandpaper. If crocus cloth does not remove the burns or the pits, use a sandpaper tool very carefully. If sandpaper is used, follow with crocus cloth to polish the contacts, wipe thoroughly with a cloth moistened with carbon tetrachloride, and dry with a clean cloth.

Note. Never use highly abrasive materials, such as emery cloth, coarse sandpaper, or carborundum paper for surfacing relay contacts.

b. Main Circuit Breakers.

(1) *General.*

(a) Type AB ''De-ion'' circuit breakers (fig. 135) are completely enclosed devices equipped with ''De-ion'' arc chambers and interchangeable trip units.

(b) The trip units are calibrated at the factory for a certain current rating and will carry 100 percent of this rating continuously. They will permit small over-currents to continue for short periods of time, but will positively trip out on sustained over-currents of 125 percent of the rating or more. On short-circuit currents they will trip out instantaneously. The current above which instantaneous tripping will occur is adjustable by means of lever ''L'' (fig. 234).

(c) The intermediate power amplifier breaker, K-401, is adjustable from 400 to 1200 amperes, and the power amplifier breaker is adjustable from 600 to 2250 amperes. Generally speaking, these adjustments are to be set to as low as will allow the power supply to be turned on the majority of the time without being tripped out immediately by the initial surge current. An occasional trip out due to surge current is expected, and is, in fact, a good indication that the breaker is working properly. The intermediate power amplifier breaker should therefore be set at or near the low current (400 amperes) rating. The power amplifier breaker should be set at approximately 1,200 am-

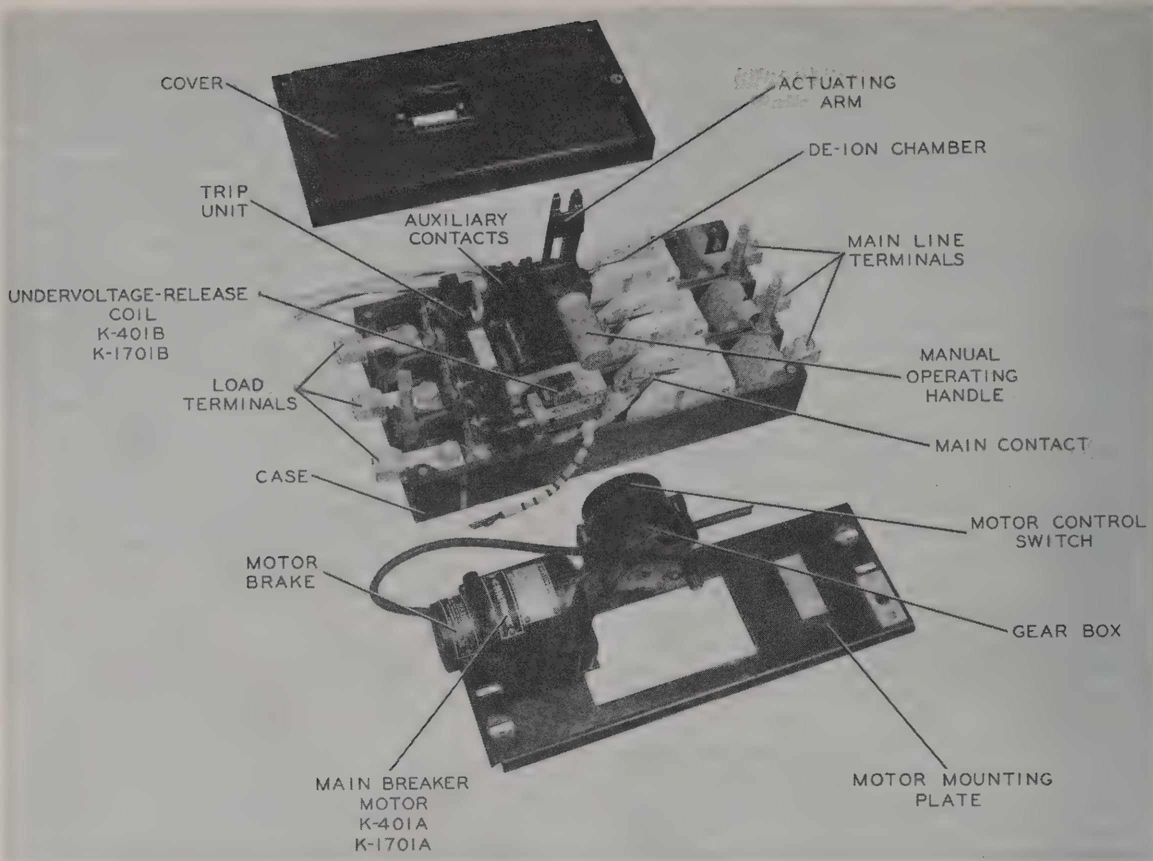


Figure 135. Main Breaker, K-401 or K-1701, Covers Removed.

peres, which is two detent positions away from the low end.

(d) The breakers K-401 and K-1701 are both motor operated and operate when the PLATE ON buttons are depressed. They also contain undervoltage-release coils, which cause the breakers to trip out if the applied voltage becomes too low.

(2) *Mounting breakers.* The long dimension of these breakers can be mounted either vertically or horizontally. When mounted vertically, the line, or arc-chamber end, of the breaker, must be at the top. To remove the cover plate on which the motor is mounted and gain access to the interior of the breaker, it is necessary to remove the three screws (two at the top and one at the bottom) which hold the bakelite cover to the body of the breaker. A second plate must be removed in much the same manner as the first to gain access to the inside of the breaker. The metal projection which engages the motor and is attached to the trip handle is removed by removing the two screws which secure it to a bakelite projection from the breaker unit.

(a) *To remove trip units.* Open the breaker, take off the cover plates as described above, and then remove the load terminal studs "F" and screws "C" and "D". The trip unit can then be lifted out of the frame.

(b) *To install trip units.* Place the trip unit in the frame (fig. 234), making sure that the ends of the pin in the trip unit bracket set in the slots on the mechanism at "E". First screw "C" and then "D" firmly in place.

(c) *To remove and install undervoltage-release coil.* Before attempting to remove the undervoltage-release coil, the cover plates must be removed as described above. The undervoltage-release coil is seen on the right hand side of the breaker. It is removed by taking out the two screws which extend upward through part of the frame of the breaker into the undervoltage-release coil assembly. The coil is then slipped out.

(3) *Adjustment of main circuit breakers.* The resetting operation takes place every time the equipment is turned on. The motor must operate the breaker handle past the normal OFF position before operating it to the ON position. This requires a critical adjustment of the motor mounting-plate position with respect to the breaker. The motor is mounted on a metal plate which has slotted holes for its mounting screws. These slots allow the motor plate to be raised or lowered to effect this adjustment.

(a) The first step in adjusting K-401 is to set the DELTA-WYE-OFF switch to the OFF position. The first step in adjusting K-1701 is to remove the caps from all rectifier tubes in Power Supply Assembly PP-1089/FRT-22 and let them hang free; they must not touch anything or hang near anything.

(b) Proceed to turn the equipment on in the normal manner. If breaker K-401 is being adjusted, turn on the intermediate power amplifier plate voltage by depressing one of the PLATE ON buttons on the IPA cabinet or its power supply. If breaker K-1701 is being adjusted, turn on the power amplifier high voltage by depressing one of the PLATE ON buttons on either the PA cabinet or its power supply. From this point, the procedure is identical for adjustment of either K-401 and K-1701.

(c) Depress the PLATE ON button.

1. If the adjustment has been properly made, a brief motor noise and clicking followed by a solid thud will be heard only once, and then the H.V. PLATE indicator lamp on the front panel will light and remain lighted.

2. If the motor plate is too low, the breaker will attempt to close with repeated thuds in rapid succession, and the H.V. PLATE indicator lamp will not light.

3. If the motor mounting plate is too high, the motor will run continuously, and the H. V. PLATE indicator light will remain off.

c. Servicing the Air Filters.

(1) To remove the filters, remove the flanged plate at the top and bottom of the filter, and slip the filters off. On the power supplies, the baffle plates will have to be removed before the filter may be removed.

(2) The filters may be cleaned by boiling in water and cleaning solvent (such as Oakite or tri-sodium phosphate). Boil the filter until it appears clean. Allow the panel to dry, and recharge by immersing in SAE 30-50 oil. Drain off the excess oil before replacing the filter. A spare filter may be installed during the cleaning process.

d. Servo Motor Brakes. The primary function of the servo motor brake is to prevent hunting. The brakes will not normally require service. However, if a brake should for some reason require adjustment, loosen the four mounting screws, and position the brake parts so that the brake shoe is allowed a free travel of approximately 1/64 to 1/32 inch when the solenoid is operated by hand. In its normal position, the brake shoe should exert a slight pressure on the brake drum. Spring tension should be adjusted so that sufficient braking action is obtained but the spring is not so tight that the solenoid core does not seat properly when the coil is energized.

66. Refinishing

Instructions for refinishing badly marred panels on exterior cabinets are given in TM 9-2851.

Section III. ALIGNMENT PROCEDURES

67. R-F Oscillator O-91/FRT-5, Alignment

a. Test Equipment Needed for Alignment.

(1) Signal generator, G.R. Type 805C or equivalent.

(2) Test oscillator with the following crystals: 100 kc, 700 kc, 800 kc, 887.5 kc, 2.2 mc, 4.0 mc, 10.1 mc, and 19.1 mc.

(3) VTVM, Hewlett Packard, model 510A or equivalent.

(4) Oscilloscope, Dumont, model 208 or equivalent.

(5) Power Supply PP-454/FRT-5 or equivalent.

(6) Unit interconnecting cable.

(7) Power cord.

b. Equipment Set Up.

(1) Connect R-F Oscillator O-91/FRT-5 with the power cable.

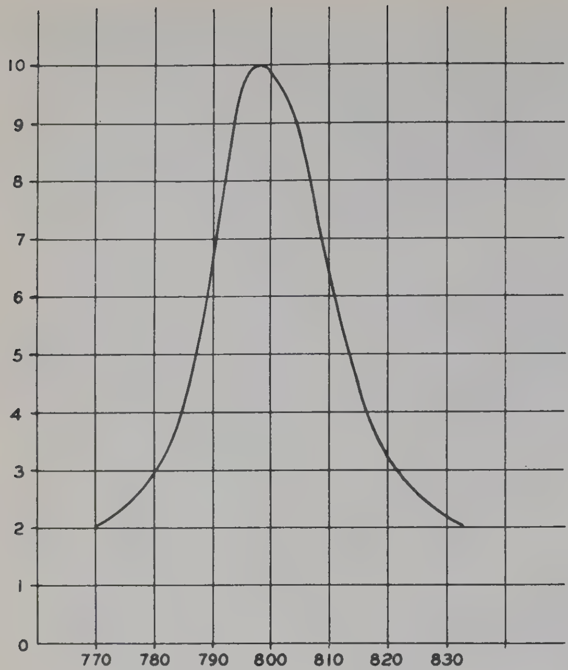


Figure 136. R-F Oscillator O-91/FRT-5, 800-KC I-F Selectivity Curve.

(2) Place power supply switch S-1002 in 115-volt position and connect line cord to 115-volt 60 cps power source.

(3) Before connecting power supply, check resistance from terminal 6 on J-101 to ground. It should be approximately 10,000 ohms. A check from terminal 5 on J-101 to ground should indicate an infinite resistance, or open circuit.

Note. Tubes which must be in their sockets and those which must be removed from their sockets to perform the various alignment procedures are clearly indicated in the procedures. The remaining tubes may be left in or out. For this reason the procedure may indicate replacement of a tube already in the unit.

c. 800 KC Second I-F Alignment.

(1) *Equipment setup.*

(a) Connect signal generator at V-111, pin 1.

(b) Adjust signal generator to 800 kc. Check by zero beating with a test oscillator employing an 800 kc crystal. Output of both oscillators should be unmodulated.

(c) Connect VTVM at T-109, pin 6.

(d) Remove V-108 and V-109 from their sockets.

(2) *Alignment procedure.*

(a) Connect 220-uuf capacitor across T-109 secondary, pins 4 and 6.

(b) PLATE power ON.

(c) Tune T-109 primary for peak reading on VTVM by adjusting top slug of T-109.

(d) PLATE power OFF.

(e) Connect a 220-uuf capacitor to T-109, pins 1 and 3.

(f) PLATE power ON.

(g) Tune secondary for peak on VTVM by adjusting bottom slug of T-109.

(h) PLATE power OFF.

(i) Reduce the signal generator output to a low level to obtain a suitable indication. Remove 220-uuf capacitor.

(j) PLATE power ON.

(k) Check selectivity by varying the 800-kc signal generator frequency ±30 kc.

(l) PLATE power OFF.

(m) Connect the signal generator lead to V-110, pin 7. Adjust for 800 kc output, 1 volt unmodulated.

(n) Connect VTVM leads to T-108, terminal 6.

(o) Repeat steps (a) through (k), applying now to V-110 and T-108.

d. 875-900 KC First I-F Alignment.

(1) *Equipment setup.*

(a) Power OFF.

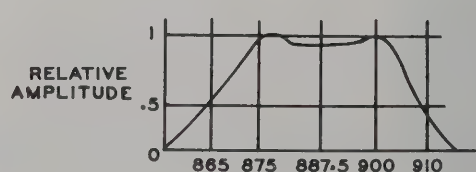


Figure 137. R-F Oscillator O-91/FRT-5, 875-900 KC I-F Selectivity Curve.

(b) Insert tubes V-108 and V-109 in their sockets.

(c) Remove V-110 from its socket.

(d) Connect signal generator leads to V-109, pin 1.

(e) Adjust signal generator to 887.5 kc. Check by zero beating with a test oscillator employing an 887.5 kc crystal. Output should be 1 volt, unmodulated.

(f) Connect VTVM leads at T-108, pin 6.

(2) *Alignment procedure.*

(a) Connect a 1000-uuf capacitor across the secondary of T-107, pin 6 to ground.

(b) PLATE power ON.

(c) Tune primary for peak reading on VTVM by adjusting top slug of T-107.

(d) PLATE power OFF.

(e) Transfer the 1000-uuf capacitor to T-107, pin 1 to ground.

(f) PLATE power ON.

(g) Tune secondary for peak reading on VTVM by adjusting bottom slug of T-107.

(h) PLATE power OFF.

(i) Move the signal generator lead to V-108 socket, pin 7. Adjust for 887.5 kc, 1 volt unmodulated output.

(j) Connect VTVM lead to T-106, terminal 6.

(k) Repeat steps (a) through (k) applying now to V-108 and T-106.

(l) Check overall selectivity curve, (fig. 137).

e. Regenerative Divider Alignment.

(1) *Equipment setup.*

(a) PLATE power OFF.

(b) Remove V-110, 6BE6, from its socket.

(c) Insert V-127 and V-128.

(d) Adjust signal generator to 100 kc. Check by zero beating with a test oscillator employing a 100 kc crystal. Output should be kept as low as possible consistent with a suitable indication.

(e) Connect VTVM at V-129 socket, pin 1.

(2) *Alignment procedure.*

(a) PLATE power ON.

(b) Adjust T-111 top slug until peak reading is indicated on VTVM.

(c) PLATE power OFF.

(d) Connect Signal generator at V-128 socket, pin 1.

(e) Adjust signal generator to 700 kc. Check by zero beating with a test oscillator employing a 700-kc crystal. Output 0.1 volt unmodulated.

(f) Connect VTVM at V-127 socket, pin 7.

(g) PLATE power ON.

(h) Adjust T-111 bottom slug until peak reading is indicated on VTVM.

(i) PLATE power OFF.

(j) Connect signal generator at V-111, pin 1.

(k) Adjust signal generator to 800 kc. Check by zero beating with a test oscillator employing an 800-kc crystal.

(l) Connect VTVM to T-109, pin 4. A -15 volt d-c reading should be obtained.

(m) Insert V-123, V-124, V-125, V-126, and V-129.

(n) Connect phones in J-103.

(o) PLATE power ON. Check -15 volts d-c on VTVM at 800 kc. (Adjust signal generator output if necessary.)

(p) Vary the signal generator tuning from 750 to 850 kc. Note the frequencies at which the audible note from the divider starts as the frequency is varied toward 800 kc.

(q) The divider should function between 780 and 820 kc or better.

(r) If the divider does not start at 780, set the signal to 780 kc and adjust T-111 bottom slug until a smooth audible note is obtained.

(s) One or two adjustments between steps (r) and (s) should be sufficient to align the dividers.

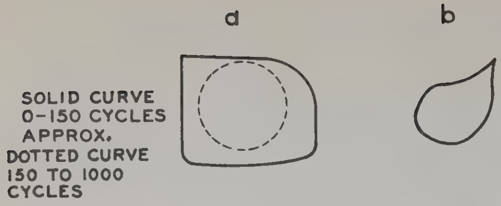


Figure 138. R-F Oscillator O-91/FRT-5, Phase-Splitter Phase Relationships.

f. 100-KC Phase Splitter.

(1) *Equipment setup.*

(a) PLATE power OFF.

(b) Tubes V-111, V-123, V-124, V-125, V-126, V-127, and V-128 should be in place.

(c) V-110 should be removed.

(d) Connect oscilloscope vertical plate at V-121, pin 2, horizontal plates at V-119 socket, pin 2.

(e) Connect signal generator lead at V-111, pin 1. Adjust for 800 kc. Check by zero beating with a test oscillator employing an 800 kc crystal. Output 0.1 volt range.

(f) Connect VTVM lead at V-122 socket, pin 2.

(2) *Procedure.*

(a) PLATE power ON.

(b) A reading of 15 to 20 volts a-c at 400 cps approximately should be obtained on the VTVM.

(c) The scope will show the phase relation of the two audio phases, and should conform approximately to the shape shown in figure 138a. Check the balance of the scope amplifiers so that the vertical and horizontal traces are equal.

Note. If the pattern obtained is different from that shown in fig. 138a, and is similar, for example, to the pattern shown in fig. 138b, adjustment of the upper and lower slugs of T-112 will correct the condition.

g. Motor Control Circuit Check.

(1) *Equipment setup.*

(a) PLATE power OFF.

(b) The following tubes should be in their sockets: V-101, V-119, V-120, V-121, V-122, V-123, V-124, V-125, V-126, V-127, V-128 and V-129.

(c) V-110 should be removed.

(d) Connect signal generator lead at V-111 socket, pin 1. Adjust for 800 kc. Check by zero beating with a test oscillator employing an 800 kc crystal.

(e) Connect VTVM at T-109, pin 4. A reading of -15 volts d-c should be obtained.

(f) Connect oscilloscope as in step f. (1) (d).

(2) *Procedure.*

(a) Remove cover on AFC capacitor, C-126, to observe rotation.

(b) PLATE power ON.

(c) Move the signal generator frequency slowly through zero beat as indicated by the scope picture. The motor should rotate at frequencies of less than 1 cps and up to 750 cps.

h. Harmonic Amplifier Alignment.

(1) *Equipment setup.*

(a) Remove tubes V-103 and V-108. Insert V-104 and V-105.

(b) Standard Switch, S-105, to EXTERNAL.

(c) Connect signal generator at V-103 socket, pin 7, through .01 uf capacitor. Adjust to 10.1 mc. Output 0.1V, unmodulated.

(d) Connect VTVM lead at V-108 socket, pin 7.

(2) *Alignment procedure.*

(a) Adjust OUTPUT TUNING to 2.2.

(b) Center all trimmers.

(c) Adjust T-101 slug for approximately maximum output.

(d) Adjust T-102 slug for maximum output.

(e) In the following steps, reduce signal generator output until signal on V-108, pin 1, is less than 3 volts.

(f) Tune T-101 slug to maximum. Retune T-102 slug.

(g) Adjust signal generator to 19.1 mc.

(h) Set OUTPUT TUNING control to 4.0 mc.

(i) Tune trimmers C-128a and C-128b for maximum signal.

(j) Return signal generator tuning to 10.1 mc and repeat steps (d) through (i).

Note. Over-compensating on steps (f) and (i) after the first setup reduces the number of tracking cycles necessary to obtain the required results. When properly aligned, the 2.2 mc and 4.0 mc output points should coincide with those frequencies.

i. Oscillator End Points. Check end points of INTERPOLATION OSCILLATOR and MASTER OSCILLATOR for exact settings of 600 and 800 kc, and 1 and 1.5 mc, respectively.

j. Multipliertracking.

(1) *Equipment setup.*

(a) Remove V-108 from socket. Insert V-131, V-112, and V-113.

(b) Place Crystal Switch on EXT.

(c) Set MASTER OSCILLATOR dial on R-F Oscillator O-91/FRT-5 (   ) to 2.2 mc.

(d) Connect VTVM at V112, capacitor C120D.

(e) Connect J108 to 50-ohm load.

(2) *Alignment procedure.*

(a) Set output tuning at 2.2 mc.

(b) Tune T104 slug for maximum output.

(c) Transfer VTVM to V108, pin 7.

(d) Tune T105 slug for maximum output.

(e) Set MASTER OSCILLATOR dial on R-F Oscillator O-91/FRT-5 to 4.2 mc.

(f) Adjust output tuning to 4.2 mc.

(g) Adjust trimmers C128C and C128D for maximum output.

(h) Return MASTER OSCILLATOR dial on R-F Oscillator O-91/FRT-5 to 2.2 mc and repeat steps (d) through (g).

Note. Over-compensating on steps (d), (e), and (g) after the first setup will reduce the number of cycles necessary for proper tracking.

k. 100-KC Crystal Oscillator Alignment. Adjust crystal oscillator to exactly 100 kc by adjusting C103.

68. Frequency-Shift Keyer KY-45/FRT-5 Alignment

a. Test Equipment Needed for Alignment.

(1) Signal Generator, General Radio, type 805C.
(2) Secondary frequency standard.
(3) Oscilloscope.
(4) Square wave generator.
(5) Audio oscillator.
(6) Dummy load, 50 ohms.
(7) VTVM, Ballantine type 300A.
(8) Keying relay, Western Electric 215A.
(9) Discriminator (refer to figure 142).

b. Equipment Set Up.

(1) Interconnect Frequency Shift Keyer KY-45/FRT-5 and Power Supply PP-454/FRT-5 with the power cable.

c. R-F Alignment.

(1) *Equipment setup.*

(a) Connect cable between J-1002 on Power Supply PP-454/FRT-5 and the Frequency Shift Keyer KY-45/FRT-5 at J1404.

(b) Connect 115-volt a-c at J1406. Allow oven temperature to stabilize for 60 minutes.

(c) Remove the 200-kc oscillator tube, V1411.

(d) Set RF TUNING dial at 4.0 mc.

(e) METER SWITCH should be in PA GRID position.

(f) Connect signal generator tuned at 4.0 mc with an output of approximately 2.0 volt at EXT. OSC. INPUT, J1401. EXTERNAL OSCILLATOR LEVEL control should be on 0 DB.

(g) Set all adjustable ceramic capacitors approximately 5 degrees engaged and all tuning cores halfway in.

(h) Place MODULATOR BALANCE control, R1416, to either maximum or minimum position.

(2) *Alignment procedure.*

(a) Place POWER switch in ON position.

(b) Adjust capacitors C1406, C1408 and C1413 so that maximum grid current is indicated on M1401.

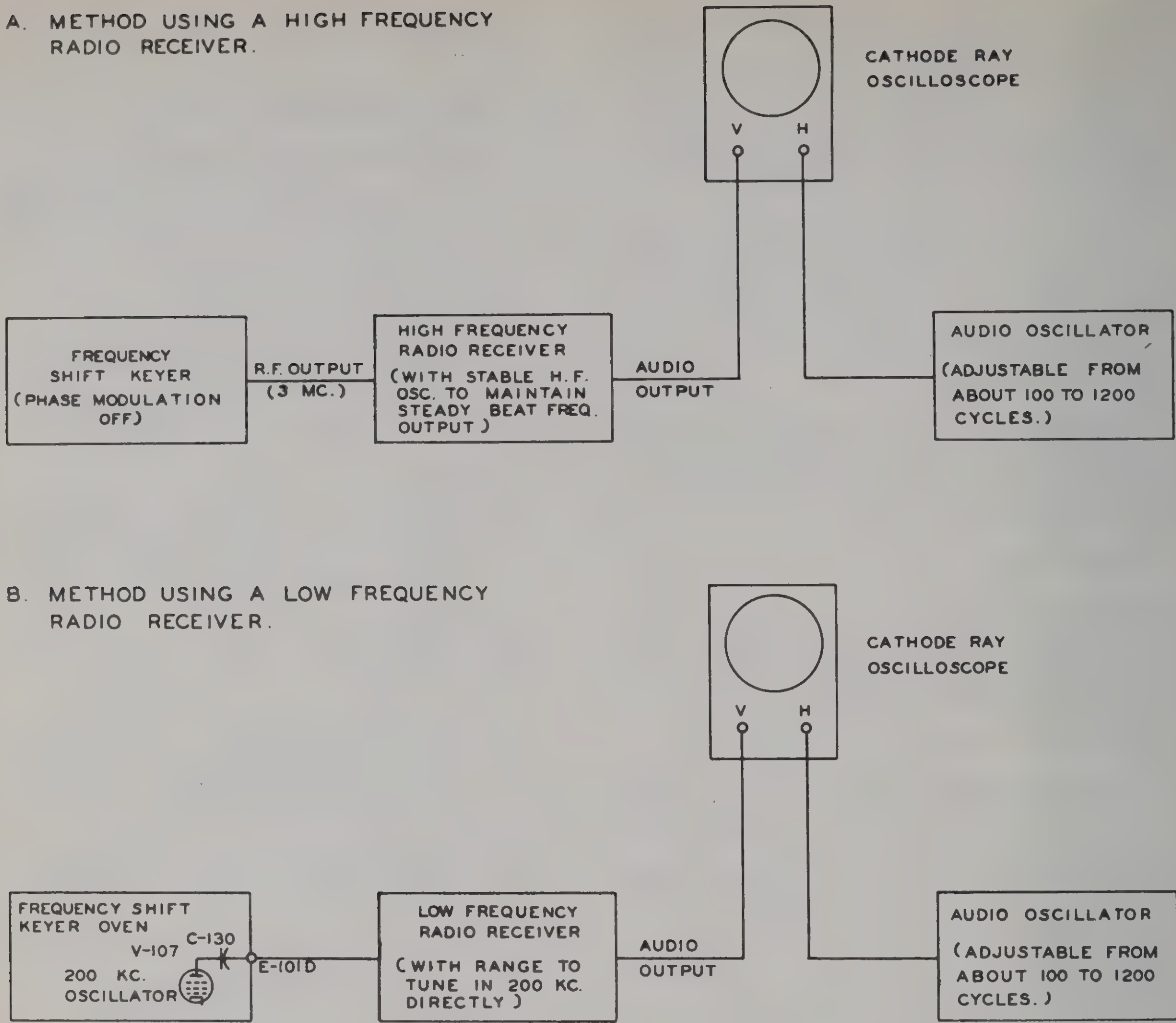


Figure 139. Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Connections to Display Frequency-Shift Patterns.

(c) Change signal generator frequency and RF TUNING to 2.2 mc and adjust cores of inductors L1402, L1406, and L1407 for a maximum grid current indication.

(d) Repeat steps (b) and (c), alternating between 4.0 and 2.2 mc until no further increase is noted.

(e) Place METER SWITCH in PA PLATE position. Turn output control R1430 to maximum.

(f) Tune signal generator to 4.0 mc and adjust C1419 for a minimum plate current indication.

(g) Change signal generator to 2.2 mc and adjust core in L1411 for minimum plate current. Repeat steps (f) and (g) until no retuning is required to bring plate current to minimum. Connect 50-ohm load at J1402.

(h) Replace the 200-kc oscillator tube, V1411.

d. Mixer Balance Adjustment.

(1) Connect signal generator tuned to 1.8 mc at EXT. OSC. input, J1401. EXTERNAL OSCILLATOR LEVEL control should be set at 0 DB.

(2) Turn RF Tuning dial to approximately 2.0 mc. Grid current and output should be indicated.

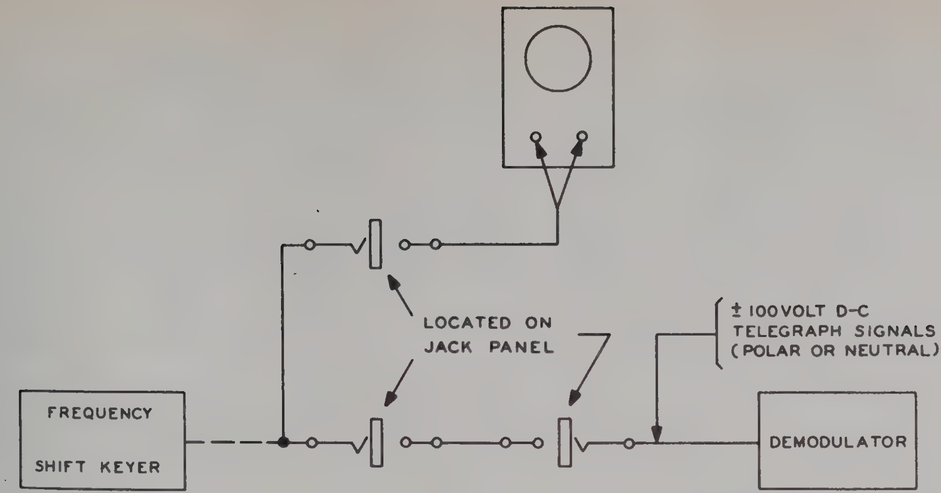


Figure 140. Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Connections to Display Waveform of Input Signals.

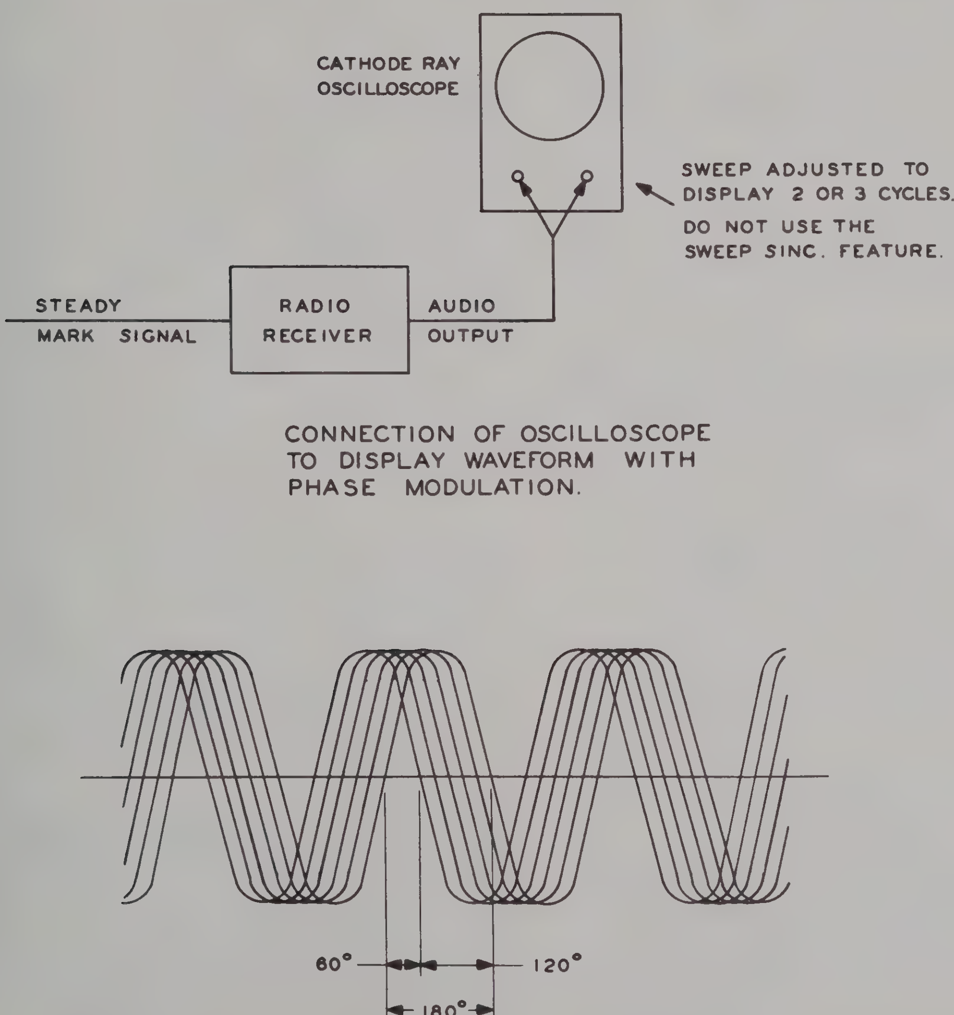
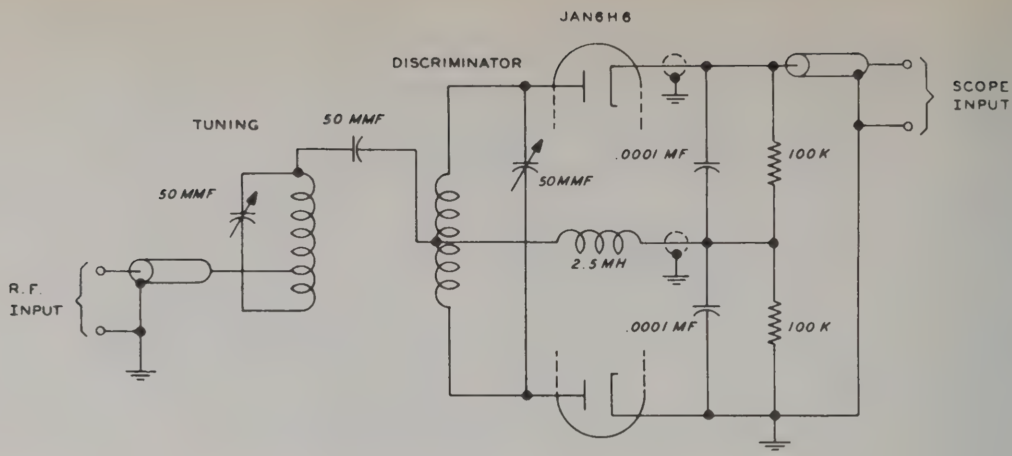


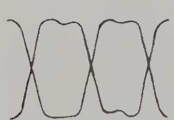
Figure 141. Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Connections to Display Phase Modulation Patterns.



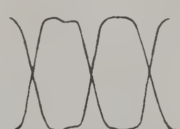
COILS ARE WOUND ON A 1 ½ INCH DIAMETER FORM, SIDE BY SIDE, AND SINGLE LAYER CLOSE WOUND. DISCRIMINATOR COIL IS CENTER-TAPPED

FREQ. MC	TURNS TUNING	TAP TUNING	TURNS DISCRIMINATOR	SPACING BETWEEN COILS	SIZE WIRE
1.0 – 2.7	52	3-1/2	52	1/8 IN.	28 D.C.C.
1.78 – 4.95	28	2	28	5/16 IN.	26 D.C.C.
3.86 – 8.80	13	1-3/4	13	3/8 IN.	26 D.C.C.
6.82 – 19.0	5	3/4	5	5/16 IN.	26 D.C.C.
10.8 – 28.0	3	1/3	3	5/16 IN.	26 D.C.C.

WAVE FORMS OF R.F. OUTPUT FOR DIFFERENT POSITIONS OF WAVE SHAPING SWITCH S-1404 AND FOR DIFFERENT DOT SPEEDS.



POS. 1
60 DOTS

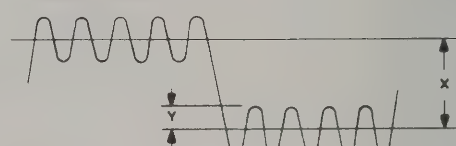


POS. 2
100 DOTS

POS. 3
200 DOTS

POS. 4
240 DOTS

(1) WAVE FORM (APPROX. ± 1 RADIAN OF PHASE MODULATION.)



(2) APPROXIMATE DETERMINATION OF PHASE MODULATION.

$$\text{PHASE MODULATION (RADIANS)} = \frac{\frac{Y}{X} \times \text{FREQUENCY SHIFT}}{\text{FREQUENCY OF PHASE MODULATING OSCILLATOR}}$$

MULTIPLY BY $\frac{360}{2\pi}$ TO CONVERT RADIANS INTO DEGREES.

EXAMPLE:

FREQUENCY SHIFT = 850 CYCLES
FREQ. OF PHASE MOD. OSC. = 200 CYCLES
FROM ABOVE WAVE FORM Y/X = 1/4 APPROX.

$$\text{PHASE MODULATION} = \frac{\frac{1}{4} \times 850}{200}$$

$$= 1.06 \text{ RADIANS}$$
OR
$$60.7 \text{ DEGREES}$$

Figure 142. Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Connections to Display R-F Signal Output.

(3) Turn RF TUNING dial to approximately 3.0 mc. Grid current and output should be indicated. Adjust MODULATOR BALANCE control, R1416 to obtain minimum plate current.

(4) Turn RF TUNING dial back to 2.0 and check output and grid current. Output should be 3 watts with 2.0 volts input to J1401 and EXT. OSC. LEVEL at 0 DB.

e. Test Operate Function Switch Set Up.

(1) Adjust BASIC SHIFT control to 0, TEST OPERATE SWITCH to carrier position. TRANSMITTER MULT. FACTOR switch to 1, PHASE MODULATION DEGREES control to 0 (off).

(2) Adjust 200-kc oscillator until an exact zero-beat is obtained between its fifth harmonic and a 1-mc secondary frequency standard.

f. Frequency Shift Calibration.

(1) Begin with equipment adjusted as in step e (2). Turn FREQUENCY SHIFT control.

(2) Adjust KEYER BALANCE control, R1450, to return signal to zero beat. Turn plate TEST OPERATE switch to SPACE position. Adjust frequency shift calibration control to obtain 1000 cps. Plate switch on MARK, frequency should increase to approximately 1000 cps.

(3) If 1000 cps shift is not obtained, adjust FREQUENCY SHIFT CALIBRATION control and recheck. Correct adjustment is obtained when the total shift is 2000 cps.

(4) Set TEST OPERATE switch on FSK. Apply a mark signal on key line J1407A. Adjust limiter adjust R1439 until a note is heard which is the same frequency as the TEST-OPERATE MARK. Frequency should increase as in step (2). Change to space signal, and frequency should decrease, giving a total shift of 2000 cps.

g. Transmitter Mult. Factor Control Accuracy. Place TRANSMITTER MULT. FACTOR control in position 1, TEST OPERATE switch in the carrier position and the FREQUENCY SHIFT control to maximum shift. Keyer balance must be correct as in paragraph f above. Rotate TEST OPERATE switch to either mark or space, which will produce a 1000 cps beat note. Adjust the audio oscillator to produce 1:1 oscilloscope pattern. Successively greater ratios of oscilloscope pattern should be obtained as the TRANSMITTER MULT. FACTOR control is rotated clockwise.

TRANSMITTER MULT. FACTOR CONTROL POSITION	OSCILLOSCOPE PATTERN
1	1:1
2	2:1
4	4:1
8	8:1

The foregoing ratios shall be obtained by varying the audio oscillator not more than ±20 cps at each position.

h. Carrier Shift Linearity for Photo Input. Place TEST-OPERATE switch in photo position. Adjust photo-adjust, R-1448, so that 15 ma into the photo key line J1407C yields zero cycles shift from carrier. Vary the line current from 30 ma to 0 ma in 5 ma steps. The amount of resultant shift should be within the following limits.

LINE CURRENT	REQUIRED SHIFT	TOLERANCE +5%
30.0	+1000 cps	±50 cps
25.0	+ 667 cps	±33-1/3 cps
20.0	+ 333	±16-2/3 cps
15.0	0	0
10.0	- 333	±16-2/3 cps
5.0	- 667	±33-2/3 cps
0	-1000	±50 cps

i. Phase Modulation Oscillator. Turn basic shift to obtain 850 cps shift (425 cps above and below) carrier.

(1) Turn PHASE MODULATION control on.

(2) Compare the output of the 200-cps oscillator at J-1403 terminal 2 with an audio oscillator, using an oscilloscope to check the frequency.

(3) Set WAVE SHAPING switch on position 3.

(4) Connect a 20 dot-cycle per second signal to key line input.

(5) Connect a discriminator and oscilloscope to keyer output jack, J-1402. The output should be terminated in a 50-ohm load.

(6) Adjust the PHASE MODULATION dial to obtain one radian of phase modulation as indicated by the oscilloscope pattern. (Refer to figure 141 and 142).

j. Wave Shaping.

(1) Adjust keyer and exciting source for 3.5 mc output.

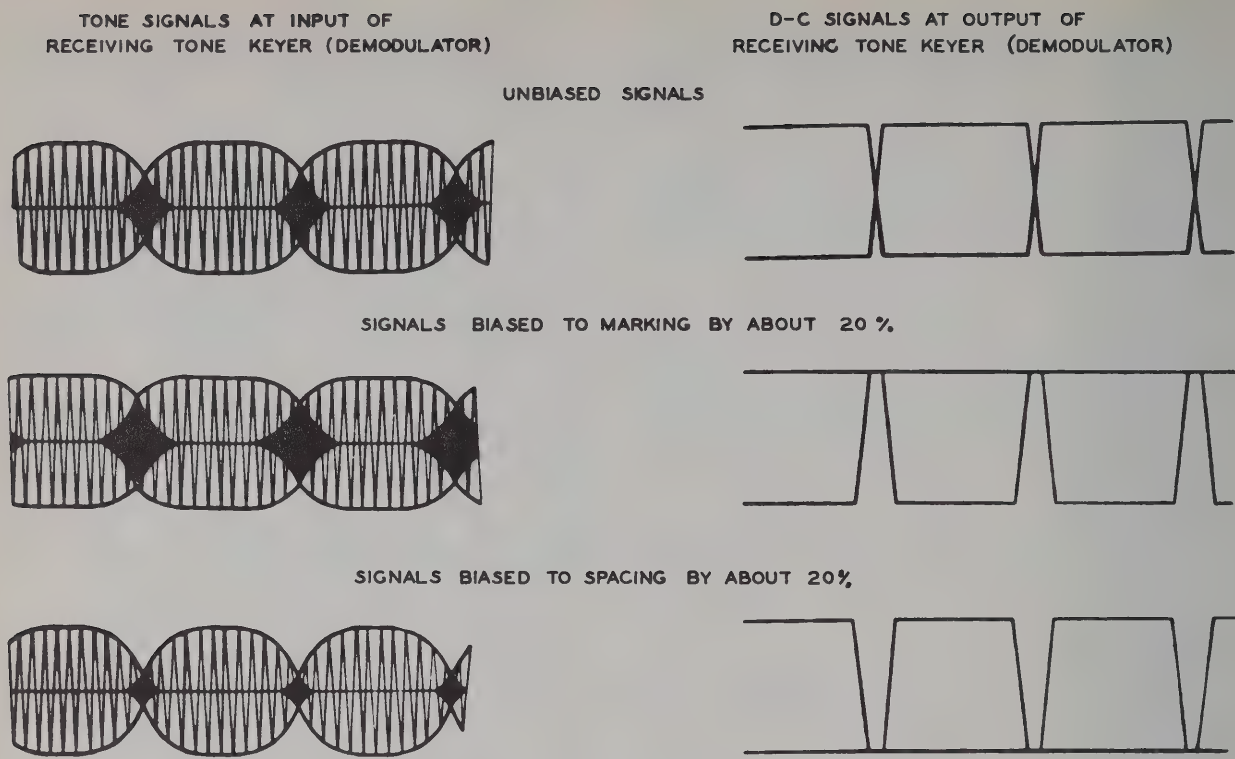


Figure 143. Frequency-Shift Keyer KY-45/FRT-5, Oscilloscope Patterns of Signal Bias.

(2) Connect square wave generator to the keying line input jack J-1407A.

(3) Check wave forms of r-f output for different positions of wave shaping switch S-1404, and for different dot speeds as shown in figure 142.

69. Radio Transmitting Set AN/FRT-22 Alignment

a. Test Equipment Needed for Alignment.

(1) Dummy load.
(2) Secondary frequency standard.
(3) Vacuum tube voltmeter.
(4) Q meter, Boonton 200A.
(5) Audio oscillator H-P 200 BR or equivalent.
(6) AC Voltmeter, 0-10 volt, 1/2% accuracy.

b. Equipment Setup.

(1) Interconnecting cables between Power Supply Assembly PP-1088/FRT-26, Power Supply Assembly PP-1089/FRT-22, and the external units Power Supply Control C-1402/FRT-26, Power Control C-598/FRT-6, Power Transformer TF-196/FRT-26, and Power Transformer TF-197/FRT-22 are to be connected.

(2) The 230-volt 3-phase line is to be connected to Power Supply Control C-1402/FRT-26.

c. Adjustment of First Multiplier Plate Tuning Coil and Capacitor.

(1) Plug in servo amplifier Z-501 and allow it to warm up.

(2) The multiplier chassis should be tipped forward so that the type 807 tubes and their associated tank circuits are readily accessible. The first multiplier is the one to the left. Tuning the FIRST MULTIPLIER PLATE TUNING control $\boxed{\text{A}}$ on the front panel should cause the associated plate tuning circuit, C-511 and L-503, to follow. If the circuit is wired properly, the rolling coil contact will move toward the top of the exciter chassis as the control is rotated clockwise. The servo drive motor should operate only when the control is turned and should stop a short time after the control has been operated.

(3) If the servo mechanism does not operate smoothly, adjust the sensitivity and anti-

hunt controls on the servo amplifier (refer to par. 31g (5)).

(4) If it is impossible to make the motor follow the control $\boxed{A}$ in accordance with the above outlined procedure, it may be an indication that the motor field is reversed. This can be checked by reversing the leads on terminals 11 and 12 on the back side of connector J-806, mounted in the common servo amplifier enclosure (fig. 162).

(5) After the servo control has been checked and adjusted, carefully set the variable air capacitor C-511 for maximum capacity. At this capacity setting, place the rolling contact of L-503 on the last turn at the bottom (nearest the drive unit) end of the coil. Remove the servo drive unit by loosening the two hold-down screws. Then turn the front panel control $\boxed{A}$ counter-clockwise to zero on its scale. This sets the servo drive motor at its low-frequency limit.

(6) Replace the drive unit and check its operation to see that the circuit operates properly throughout its range.

Caution: The fuse mounts located on either side of this multiplier unit are energized during these tests, and accidently contact with their terminals will cause shock.

d. Adjustment of Second Multiplier Plate Tuning Coil and Capacitor.

(1) Plug in servo amplifier Z-502 and wait for it to warm up.

(2) This circuit is on the right side of the frequency multiplier chassis. Follow the same procedure outlined for the ADJUSTMENT OF FIRST MULTIPLIER PLATE TUNING COIL AND CAPACITOR except for paragraph (5) and (6).

(3) After the servo control has been checked and found to operate satisfactorily, carefully set the variable air capacitor C-517 to near minimum capacity so that the tips of the rotor blades and the stator blades are just ready to start meshing. At this capaitor setting, set the coil roller on the top (end away from the drive unit) turn of coil L-506.

(4) Remove the servo drive unit by loosening the two hold-down screws. Then tune the front panel control $\boxed{B}$ completely clock-wise to 1000 on its scale. This sets the servo drive motor to its high-frequency limit.

(5) Replace the servo drive unit and check the operation to see that the circuit operates properly throughout its range.

e. Adjustment of Driver Plate Tuning Coil and Capacitor.

(1) Plug in servo amplifier Z-503 and allow it to warm up.

(2) Check operation of the servo drive unit in accordance with the procedure outlined in paragraphs (2), (3), and (4) of the section ADJUSTMENT OF FIRST MULTIPLIER PLATE TUNING COIL AND CAPACITOR.

(3) Remove variable vacuum capacitor C-526 from the assembly.

(4) Rotate the tuning control counterclockwise until the slider on variable inductor L-509 is at the extreme right end. The dial reading should be 0.

(5) Loosen the set screws on the right end of the dual-coupled variable-air-capacitor assembly shaft and set this capacitor assembly C-533 and C-534 for maximum capacity. Retighten the set screws.

(6) Run the servo drive unit to its extreme high-frequency position by rotating the DRIVER PLATE TUNING control $\boxed{C}$ clockwise to 1000.

(7) Operate control $\boxed{C}$ to see that it is functioning properly.

(8) Set the SERVO CONTROL $\boxed{C}$ so that there is exactly 1 turn of the variable inductor L-509 between its left end and the slider.

(9) Using a Q meter or other equally accurate means, set the vacuum variable capacitor C-526 to 40.7 uuf and replace it in the circuit.

(10) Again check the operation of the circuit, readjusting anti-hunting and sensitivity controls if necessary, to obtain smooth starting and stopping (refer to par. 31a(5)).

f. Adjustment of Intermediate Power Amplifier Plate Tuning Coils and Capacitors.

(1) Plug in amplifier Z-504 and allow it to warm up.

(2) Check operation of the servo drive unit in accordance with the procedure outlined in paragraphs (2), (3) and (4) of the section on ADJUSTMENT OF FIRST MULTIPLIER PLATE TUNING COIL AND CAPACITOR.

(3) Remove variable vacuum capacitors C-569 and C-570 by opening the top and bottom clamp bands and sliding them up and outward.

(4) Disengage the drive coupling to plate tank coil L-516 and L-517 slider contacts by removing the two Phillips-head screws on each coupler. Block the top section of the couplers up to prevent them from making contact.

(5) Rotate the intermediate POWER AMP. PLATE TUNING control [D] to 1000. Note that the plate tank drive mechanism follows properly, and that its limit switch stops its operation at or just before the dial reaches 1000. Turn the control to zero and note that the mechanism follows and that the limit switch operates at or near zero on this end. Reset the control to 1000.

(6) Manually set sliding contacts one-quarter of a turn from the top of the tank coils L-516 and L-517. In this position the slider bars will be parallel and the top contact will be at the rear of the coil.

(a) With the sliders in this position and the servo drive dial set at 1000, the tank coil drive couplings should be lined up so that the top section could be lowered into place without rotating either top or bottom section. If this is not the case, the chain sprocket wheels of the drive unit must be rotated to produce alignment. This is accomplished as follows:

1. Note the number of sprocket teeth and direction that each of the two large sprockets must be moved. Write down the numbers.

2. Turn the front panel control [D] to some position near the middle of the scale, and when the drive has positioned itself, shut off the SERVO CONTROL breaker.

3. Loosen the chain tightener on the drive unit and carefully move the sprockets with respect to the driving chain, the number of teeth and direction previously noted.

4. Retighten the chain and turn on the SERVO CONTROL breaker.

5. Again set the front panel control [D] at 1000. The coupler should be lined up.

(b) Reassemble the drive couplers and operate the tank drive through its range to check smoothness of operation. Reset control [D] at 1000 and proceed to the next step.

(7) Using a Q meter, set at 15 mc, set the capacitance of the two variable vacuum capacitors C-569 and C-570 at approximately 100-uuf.

(8) Manually rotate the splined nut clockwise (toward minimum capacity), carefully keeping track of the starting point and number of turns until the stop is reached. Select the unit which required the least number of turns from its 100-uuf setting to the top, and set the other capacitor to the same number of turns, or part turns, from its 100-uuf position.

(9) Rotate both capacitor nuts one-quarter turn counterclockwise. Replace them in the transmitter, being careful not to turn the shaft in the process.

(10) Rotate the INTERMEDIATE POWER AMPLIFIER PLATE TUNING control [D] counterclockwise to zero.

g. Adjustment of Intermediate Power Amplifier Coupling Rack.

(1) Plug in amplifier Z-505 and allow it to warm up.

(2) The coupling platform should move to the rear as the POWER AMPLIFIER LOADING control [E] is rotated clockwise.

(3) Check operation of the servo drive in accordance with the procedure outlined in paragraphs (3) and (4) of the section on ADJUSTMENT OF FIRST MULTIPLIER PLATE TUNING COIL AND CAPACITOR.

(4) Remove drive chain.

(5) Manually set the platform approximately one-quarter of an inch from the limit screw located on the rear of the right track.

(6) Set control dial $\boxed{E}$ at 1000.

(7) Replace drive chain.

(8) Rotate control to the zero position, noting whether the coupler follows smoothly.

(9) Plug in amplifier Z-506 and allow it to warm up.

(10) The coil contacts should move to the top of coil as the ANTENNA TUNING control $\boxed{F}$ is turned counterclockwise.

(11) Check operation of the servo drive unit in accordance with the procedure outlined in paragraphs (3) and (4) of the section on ADJUSTMENT OF FIRST MULTIPLIER PLATE TUNING COILS AND CAPACITOR.

(12) Remove the variable vacuum capacitors, C-571 and C-572, by opening the clamp hands and sliding them out.

(13) Adjust the capacitors to one-quarter turn from minimum capacity.

(14) Set the coil slider contacts so that they just touch the straps at the bottoms of the coils. The control dial $\boxed{F}$ should read 1000. If necessary, remove the servo drive unit, set dial $\boxed{F}$ at 1000, and reinsert the motor.

(15) Replace the capacitors C-571 and C-572, and turn dial $\boxed{F}$ to zero. Do not allow the sliding contacts to jam against the top of the coil.

b. Adjustment of Power Amplifier Plate Tuning Coils and Capacitors.

(1) Plug in amplifier Z-1502 and allow it to warm up.

(2) Check operation of the servo drive unit as follows:

(a) The servo drive motor should operate only when the control is turned, and should stop a short time after the control is operated.

(b) If necessary, adjust the servo-amplifier anti-hunting and sensitivity controls so that the servo motor starts and stops smoothly (refer to par. 31a(5)).

(c) If it is impossible to make the motor follow the control in accordance with the above procedure it may be an indication that the motor field is reversed. This can be checked by reversing the leads on terminals 11 and 12 on the back side of the connector, J-806, which is mounted on the common servo amplifier enclosure.

(3) Remove variable vacuum capacitors C-1530 and C-1531 by opening the top and bottom clamp bands and sliding them up and outward.

(a) Using a Q meter and a 15-mc frequency, set the capacitance of the two variable vacuum capacitors C-1530 and C-1531 approximately 100-uuf, being careful to set them alike.

(b) Manually rotate the splined nut clockwise (toward minimum capacity). Keep track of the starting point and number of turns until the stop is reached. Select the unit which required the least number of turns from its 100-uuf setting to the stop, and set the other capacitor to the same number of turns from its 100-uuf position.

(c) Rotate both capacitor nuts one-quarter turn counterclockwise and replace them in the transmitter, being careful not to turn the shafts in the process.

(4) Disengage the drive coupling to the slider contacts on plate tank coil L-1505 and L-1506 by removing the two screws which secure the shafts, and removing the twin shafts.

(5) Rotate the PLATE TUNING control $\boxed{H}$ to the 1000 position. Note that the plate-tank drive mechanism follows properly, and that its limit switch stops its operation at or just before the dial reaches 1000. Turn the control to zero and note that the mechanism follows and that the limit switch operates at or near zero on this end. Reset to 1000.

(6) Manually set sliding contacts one-eighth turn from the top of the tank coils L-1505 and L-1506.

(a) With the sliders in this position and the servo drive dial set at 1000, the tank coil drive couplings should be lined up so that the top section could be lowered into place without rotating either top or bottom section. If this is not the case, the chain sprocket wheels of the drive unit must be

rotated to produce alignment. This is accomplished as follows:

1. Note the number of sprocket teeth and direction that each of the two large sprockets must be moved. Write this down.

2. Turn the front panel control $\boxed{H}$ to some position near the middle of the scale and when the drive has positioned itself shut off the SERVO CONTROL circuit breaker.

3. Loosen the chain tightener on the drive unit and carefully move the sprockets with respect to the driving chain, the number of teeth and direction previously noted.

4. Retighten chain and turn on the servo power.

5. Again set the front panel control $\boxed{H}$ at 1000, and the coupler should be lined up.

(b) Reassembly the drive couplers and operate the tank drive through its range to check its operation. Reset control $\boxed{H}$ to 1000 and proceed to the next step.

(7) Rotate the PLATE TUNING control $\boxed{H}$ to zero, noting whether the mechanism operates smoothly.

i. Adjustment of Antenna Coupling Rack.

(1) Plug in amplifier Z-1504 and allow it to warm up.

(2) The coupling platform should move to the rear as the LOADING control $\boxed{I}$ is rotated clockwise.

(3) Check operation of the servo drive unit in accordance with the procedures outlined in paragraphs (3) and (4) of the section on ADJUSTMENT OF FIRST MULTIPLIER PLATE TUNING COIL AND CAPACITOR.

(4) Remove drive chain.

(5) Manually set the platform approximately one-quarter of an inch from the limit screw located on the rear of the right track.

(6) Set LOADING control dial $\boxed{I}$ at 1000.

(7) Replace drive chain.

(8) Rotate control to zero.

(9) Plug in amplifier Z-1503 and allow it to warm up.

(10) The coil contacts should move to the top of a coil as the ANTENNA TUNING control $\boxed{J}$ is turned counterclockwise.

(11) Check operation of the servo drive unit in accordance with the procedure outlined in paragraphs (3) and (4) of the section on ADJUSTMENT OF FIRST MULTIPLIER PLATE TUNINGS COIL AND CAPACITORS.

(12) The capacitance of C-1532 should be at a maximum when the ANTENNA TUNING Control $\boxed{J}$ is at 0. If it is not, remove idler gear 0-1520 from the coupling drive assembly and rotate the capacitor shaft manually. Replace the idler.

(13) The coil slider contacts should be in a position of maximum inductance when the ANTENNA TUNING Control $\boxed{J}$ is at 0. If they are not, loosen drive chain 0-1551 and adjust manually. Replace drive chain.

j. Checking Operation of Control Circuits and Interlocks.

(1) Set the DELTA-WYE-OFF switch, S-401, in Power Supply Control C-1402/FRT-26 to the OFF position and close the CONTROL CIRCUIT breaker S-303.

(2) Set the PA CONTROL switch on Power Supply Assembly PP-1089/FRT-22 to the OFF position.

(3) Turn on the LV AND BIAS circuit breaker S-302.

(a) If the doors are closed the bias supply will be energized. This is indicated by the green light on the front of Radio Transmitter T-454/FRT-26.

(b) Open all doors and the keyer control panel, one at a time, checking each time to see that the bias lamp goes out when the door is opened but lights immediately when the door is reclosed.

(c) Check the bias voltage at terminal strip E-303, terminal 33. It should be approximately 400 volts negative to ground.

(4) Set the TUNE-OPERATE switch, S-310, on Power Supply Assembly PP-1088/FRT-26 to the L.V. TUNE position.

(a) Make certain there is no r-f connection to the transmitter input coaxial connector J-1201, and as a further precaution see that the R.F. EXCITATION control L is turned completely counterclockwise. Also, unless the oscillator is known to be all right, disconnect the d-c supply to the oscillator by disengaging P-509 (the single conductor Cannon connector on the connector board behind the relay rack).

(b) Push the PLATE ON button on the upper front doors of either Radio Transmitter T-454/FRT-26 or Power Supply Assembly PP-1088/FRT-26 and note that the L.V. PLATE lamp on the rectifier bay lights. If nothing happens, check bias interlock relay K-307 to see that it has closed properly before testing in the control circuit.

(c) Assuming the lamp lights and goes off as the PLATE ON and PLATE OFF buttons are operated, check the low voltage at terminal strip E-303, terminal 36. It should be approximately 600 volts positive to ground.

(d) Manually operate the plunger in any of the overload relays and listen for the sound of a relay opening and closing inside the motor-operated main circuit breaker K-401. Repeat this check with all four overload relays, K-326, K-319, K-325 and K-326.

(5) Turn the TUNE-OPERATE switch to the H. V. TUNE position. The motor-operated main circuit breaker will close.

(6) Turn the high voltage on and off by means of the control buttons on the front Radio Transmitter T-454/FRT-26 or Power Supply Assembly PP-1088/FRT-26 a few times to be sure that the circuit breaker operates every time.

(7) Turn the TUNE-OPERATE switch to the OPERATE position. Tuning resistor shorting contactor K-402 should operate within one-half second. If it does not, adjust the high voltage step-starter interval timer K-318.

(8) Turn the P.A. CONTROL switch on Power Supply Assembly PP-1089/FRT-22 to the ON position.

(9) Disconnect the tube caps from all the rectifier tubes in Power Supply Assembly PP-1089/FRT-22. Make sure these tube caps do not come in contact with the side of the cabinet or any other metal part.

(10) Turn on the BIAS circuit breaker S-1602 on Power Supply Assembly PP-1089/FRT-22.

(a) If the doors are closed the bias supply will be energized. The green lamp on the front door of R-F Amplifier AM-738/FRT-22 lights.

(b) Open all doors, one at a time, checking each time to see that the bias lamp goes out when the door is opened, but lights immediately when the door is reclosed.

(c) Check the bias voltage. It should be approximately 400 volts negative to ground.

(11) Depress the PLATE ON button on R-F Amplifier AM-738/FRT-22 or Power Supply Assembly PP-1089/FRT-22. Motor-operated main circuit breaker, K-1701, in Power Control C-598/FRT-6 should close.

(12) Turn the high voltage on and off with the control buttons on the R-F Amplifier AM-738/FRT-22 or Power Supply Assembly PP-1089/FRT-22 a few times to be sure that the circuit breaker operates every time.

(a) Manually operate the plunger in any of the overload relays and note that the main breaker K-1701 trips out. Reclose the breaker by depressing the PLATE ON button, and repeat this check with all eight overload relays, K-1601, K-1602, K-1603, K-1604, K-1605, K-1606, K-1607 and K-1608.

(13) Depress a PLATE OFF button and replace the rectifier tube caps in Power Supply Assembly PP-1089/FRT-22.

k. Adjustment of the Crystal Oscillator.

(1) Make certain the oscillator filament voltage is on. This is indicated by FILAMENT pilot lamp I-1102. Operate the TUNE-OPERATE switch to L.V. TUNE and depress a PLATE ON button. Check the oscillator cathode current. It should be approximately 10 ma. Then check the buffer cathode current. It should be approximately 35 ma. Check for proper operation of the crystal oven thermostat. The CRYSTAL HEATER indicator lamp should light periodically.

(2) Terminate the output of the crystal oscillator with a 50-ohm carbon resistor, and with a vacuum-tube voltmeter measure the r-f voltage developed across the re-

sistor. This voltage should be more than 2 volts rms.

l. Adjustment of Timing Relays.

(1) Set the automatic shutdown time delay timer K-323 for 15 minutes, and operate the AUTO SHUTDOWN switch, S-324, to ON. The timer will cause the transmitter to shut off after 15 minutes if the transmitter is left turned on with the key open.

(2) Check to see that the PLATE HOUR meters, M-305 and M-1604, are operating correctly.

(3) Push the PLATE OFF button, and set the non-automatic restart interval timer K-316, for 10 minutes.

(4) Depress the PLATE ON button and manually operate the plunger in any of the overload relays while the timer K-312 is running. The transmitter should go off and lock out.

(5) Set Automatic RESTART CYCLE COUNTER SELECTOR switch S-317 to 3, depress the PLATE ON button, and wait for the non-automatic restart timer, K-312, to complete its cycle. Manually operate the plunger in any of the overload relays two times in succession, noting that the plate control circuit recloses after each overload. Check RESTART CYCLE COUNTER STEPPER K-315 to see if it has stepped to the third contact. The amber OVERLOAD indicator lamps located on the front of each bay should be lighted.

(6) Manually operate the plunger in any of the overload relays once more. The transmitter should shut down and the lockout alarm, I-310 should sound. This horn can be turned off by depressing the PLATE OFF button. The non-automatic restart interval timer, K-312, should reset.

(7) Push the PLATE ON button and wait for 45 seconds. Then manually operate the plunger of any of the overload relays twice. The OVERLOAD indicator lamps should be lighted and should remain lighted for 10 minutes. The automatic restart interval timer K-316 should be running during this time, and the restart cycle counter stepper, K-315, should be on the third contact. After 10 minutes have elapsed, the OVERLOAD indicator lamps should go out and the restart cycle counter stepper, K-315, should reset.

m. Adjustment of the Electronic Keyer.

(1) Connect an external voltmeter to the slider terminal of the TEST KEYING LEVEL control, R-568.

(2) Rotate the INPUT LEVEL and OUTPUT LEVEL controls R-548 and R-560 to the extreme clockwise positions and set the KEYING INPUT FOR MARK control, S-502, for NEGATIVE. TEST KEY S-316, S-521, S-1503, or S-1620 should be in the closed (up) position.

(3) Set the TUNE-OPERATE switch to L.V. TUNE and depress a PLATE ON button. Set the KEYING SELECTOR, S-501, to LOCAL.

(4) Adjust the TEST KEYING LEVEL control, R-468, to obtain a reading on the volt-meter of -40 volts d-c with respect to ground.

(5) Reverse the leads of the external voltmeter and set the KEYING INPUT FOR MARK control, S-502, for POSITIVE. The voltmeter should read approximately +30 volts d-c with respect to ground.

(6) Open all test keys, set the KEYING INPUT FOR MARK control, S-502, for POLAR NEGATIVE, and note the voltmeter reading. It should be positive with respect to ground.

(7) Close TEST KEY, reverse the external voltmeter leads, and note the reading. This reading should be negative with respect to ground and equal in magnitude to the reading obtained with the TEST KEY open.

(8) If the voltages are not equal, repeat steps (6) and (7) while ADJUST C, R-573, is adjusted until the magnitudes of the two readings are equal.

(9) With the voltmeter connected negative to ground, set the KEYING INPUT FOR MARK control to POLAR POSITIVE and note the voltmeter reading with all TEST KEYS open.

(10) Reverse the voltmeter leads, close the TEST KEY, and note the voltmeter reading. This reading should be positive with respect to ground, and equal in magnitude to the reading obtained with the TEST KEY open in step (9).

(11) If these voltages are not equal, adjust ADJUST B, R-570, while steps (9) and (10) are repeated until the magnitude of these two readings are equal.

(12) Connect the voltmeter to the slider terminal of OUTPUT LEVEL control R-560. Open the TEST KEY and set the KEYING INPUT FOR MARK control to NEGATIVE.

Adjust the **OUTPUT LEVEL** control until the reading on the voltmeter is 50 volts dc. Closing the key should cause this voltage to drop to approximately zero.

(13) Turn the **KEYING INPUT FOR MARK** control to **POSITIVE**. Adjust **ADJUST A**, R-554, to obtain a voltmeter reading of 50 volts dc (key open).

(14) The voltmeter should read the same for all four positions of the **KEYING INPUT FOR MARK** control.

n. Tuning the Transmitter in Preparation for Neutralizing he Driver and Intermediate Power Amplifier.

(1) With the use of one of the jumpers supplied with the patch panel connect the **CRYSTAL OSCILLATOR OUTPUT** to the **TRANSMITTER INPUT**. Turn the **DELTA-WYE-OFF** switch to **WYE** position. Operate **TEST KEY** S-521 or S-316 to the locked-key position.

(2) With only the low voltage turned on and the r-f excitation control completely counterclockwise, check the **BUFFER** and **1st MULTIPLIER GRID** current using the **EXCITER TEST** switch and **EXCITER TEST NO. 2** meter. The current should be between one and two ma.

(3) Select an operating frequency of 20.8 mc and set up the oscillator and servo tuning system for the frequency. Use the tuning charts supplied for setting up these servo-controlled circuits.

(a) Set the **EXCITER TEST** switch to read **1st MULTIPLIER CATHODE** and **2nd MULTIPLIER GRID**.

(b) Turn up the **R.F. EXCITATION** control $\boxed{L}$ until grid current is indicated or the first multiplier cathode current is in the neighborhood of 20 ma.

(c) Tune the **1st MULTIPLIER PLATE TUNING** for maximum **2nd MULTIPLIER GRID** current.

(d) Set the **EXCITER TEST** selector to read **2nd MULTIPLIER CATHODE** and **DRIVER GRID** currents.

(e) Tune the **2nd MULTIPLIER PLATE TUNING** for maximum driver grid current.

(f) Set the **RF EXCITATION** control $\boxed{L}$ for 6 to 8 ma driver grid current.

(g) Set the **EXCITER TEST** switch to **LPA GRID RF PEAK AND LPA PLATE RF PEAK**.

(h) Tune the **DRIVER PLATE TUNING** $\boxed{C}$ for maximum reading on the **LPA GRID RF PEAK** meter. Maximum indication will be small and may easily be missed.

o. Neutralizing the Driver Amplifier.

(1) Remove the link between E-312, terminal 88, and E-318, terminal 88, located on the left wall of the power bay. This disconnects the high voltage from the intermediate power amplifier stage.

(2) Turn the **TUNE-OPERATE** switch to the **H.V. TUNE** position.

(3) Recheck the **DRIVER PLATE TUNING** $\boxed{C}$ to make certain that it is adjusted to produce maximum IPA grid current and simultaneously minimum driver cathode current.

(4) Check for proper neutralization by carefully noting that as the driver **PLATE TUNING** $\boxed{C}$ is varied through resonance, the driver grid current and the IPA grid current reach their respective peaks simultaneously. If the stage is improperly neutralized, note the approximate difference between the position at which the IPA grid current reaches its peak, and the position at which the driver grid current reaches its peak. The **EXCITER TEST** switch should be set at position 2.

(5) Open the upper front door of Radio Transmitter T-454/FRT-26 and adjust the neutralizing control, C-519, which is located directly behind the driver tube. There is a lock nut on it which must be loosened during the adjustment, and tightened again after the adjustment. Close the upper front door.

(6) Once again check for proper neutralization as in step (4) above. Note particularly whether the adjustment has improved the neutralization or not.

(7) If the neutralization has improved, the control was adjusted in the right direction. If the neutralization has become worse, the control was adjusted in the wrong direction. With this as a guide, repeat steps (4) through

(6) until the stage is properly neutralized, that is, until the IPA grid current and the driver grid current reach their respective peaks simultaneously.

(8) Adjust the PA balance control, located between the intermediate power amplifier tubes toward the front of the grid box, until the grid voltages are equal in magnitude. Normal grid currents should also be equal.

(9) Recheck the driver neutralization. If it has been upset, repeat steps (4) through (6) until the stage is again properly neutralized.

p. Neutralizing the Intermediate Power Amplifier (V-505 and V-506).

(1) With the transmitter still tuned up on 20.8 mc, as above, and the link disconnecting the high voltage still removed, remove neutralizing capacitors C-541 and C-542.

(2) Adjust the capacity of each of them to 25 uuf by means of a Q meter or other accurate capacity-measuring device.

(3) Replace the capacitors so that both of the indicator scales above the capacitor mounts are set to the same position.

(4) With TOTAL P.A. GRID current between .25 and .50 amps, tune the intermediate power amplifier plate circuit through resonance by means of the POWER AMP. PLATE TUNING control, and note the effect on the intermediate power amplifier grid current.

(5) Carefully adjust the neutralizing capacitors, varying both by the same amount. A counterclockwise adjustment will probably be necessary. Adjust in increments, each time rechecking for decreasing magnitude of grid-current dip. When neutralization is accomplished, the dip will be negligible.

(6) Replace the link which reconnects the intermediate power amplifier plate voltage.

(7) Recheck the neutralization with the intermediate power amplifier lightly loaded, i.e., with about 0.75 amp. grid current. This is accomplished by setting the POWER AMP. LOADING control $\boxed{E}$ near zero.

(8) Tune the power amplifier plate circuit to resonance by adjusting the PLATE TUNING control $\boxed{H}$ for minimum plate current.

(9) Tune the intermediate power amplifier plate circuit through resonance and watch for a dip in the intermediate power amplifier grid current. If the grid current does dip, the stage is improperly neutralized. Repeat steps (4) and (5) until no dip occurs.

(10) Make certain that all stages are resonated, and then turn the DELTA-WYE-OFF switch, located in Power Supply Control C-1402/FRT-26, to the DELTA position.

(11) Adjust the DRIVER PLATE TUNING control $\boxed{C}$ for maximum intermediate power amplifier grid current. Adjust the POWER AMP. PLATE TUNING (IPA plate) control $\boxed{D}$ for minimum IPA plate current.

(12) Set the INPUT CAPACITY control $\boxed{M}$ according to the calibration chart.

(13) Make certain that the PLATE TUNING control $\boxed{H}$ is adjusted for minimum power amplifier plate current, and then operate the TUNE-OPERATE switch to the OPERATE position.

(14) Adjust control $\boxed{D}$, the POWER AMP. LOADING (IPA loading) for approximately 2 amperes of power amplifier TOTAL GRID CURRENT. Make certain that the power amplifier plate circuit is tuned to resonance.

(15) Check the intermediate power amplifier grid currents for balance, and correct any unbalance by means of the PA balance control. If cathode currents are 10 per cent or more out of balance, proceed to correct the unbalance as follows: Interchange the intermediate power amplifier tubes, V-505 and V-506, and note the direction of unbalance. If the unbalance is reversed from the previous condition, it can be neglected, or different tubes may be tried to effect a closer balance. If, however, interchanging intermediate power amplifier tubes has no effect on the cathode current balance, it will be necessary to adjust the plate tank capacitor C-569 or C-570 for balance. To do this, loosen the clamps on the plate tank vacuum capacitors (C-569 or C-570) associated with the tube that had the lowest cathode current. Rotate the vacuum capacitor counterclockwise, but not over one-third turn, and retighten the clamps. Be careful not to hit the seal-off

tip on the glass envelope of the capacitor during this process. Recheck the balance and repeat the process as many times as is necessary to bring the cathode currents into balance.

q. Suppression of 50-MC Parasitic Oscillation.

(1) A final amplifier parasitic oscillation and its stabilizing circuit were mentioned in Chapter 4, THEORY. The oscillation occurs at approximately 50 megacycles. It occurs when excitation is removed with full plate voltage present, as in the case of off-on keying with the key open. It may or may not be indicated by high values of plate and grid current. Its presence is always audibly indicated, however. When this oscillation is taking place, a strong corona discharge will occur from the plate tank coil mounting screws, which hold the coil and its mycalex support together. They are recessed into counter-bored holes in the mycalex. The discharge occurs at the heads of the screws and appears to be emanating from the holes in the mycalex. It can nearly always be heard and can usually be seen.

(2) This oscillation is a result of a 50-megacycle tank circuit formed by the capacity branch of the plate tank circuit. The plate coils L-516 and L-517 can be considered r-f choke coils feeding d-c to the plates at this frequency. The tank capacity branch consists of the two variable vacuum capacitors C-569 and C-570 and their lead inductance in series from plate to plate. At 50 megacycles the inductive reactance of this series circuit is greater than the capacitative reactance so that the entire circuit is a plate-to-plate inductive reactance. This resonates with the tube capacity at 50 megacycles. The neutralizing circuit is not properly balanced at this frequency because of its series inductance. The result is that the feedback through the neutralizing capacitors C-541 and C-542 exceeds the feedback through the grid plate capacity.

(3) In order to prevent this type of oscillation, an antiresonant circuit is inserted in series with the neutralizing lead to reduce feedback in the vicinity of 50 megacycles. Parts of these circuits are designated as E-523 and E-524 in the schematic diagram. They consist of a 64-uuf ceramic capacitor, C-539 and C-540, in series with a two-turn coil shunted across a portion of the neutralizing capacitor lead. The Q of this circuit is made very low by shunting the coil with a 50-ohm carbon resistor. To be effective, this circuit must be resonant at the same frequency as the parasitically resonant circuit in the plate. However, this plate-to-plate circuit through the tank capacitors varies in frequency as the plate tank tuning capacitors are varied. It covers a frequency range of approximately 48 to 58 megacycles. This trap circuit in the neutralizing leads must, therefore, be effective across this full frequency range. It has been found by experiment that if the fundamental resonance of the trap is approximately 50 megacycles it will be effective. Occasionally, however, due to minor variations in components, the trap circuit may be too high or too low in frequency so that the oscillation may occur at

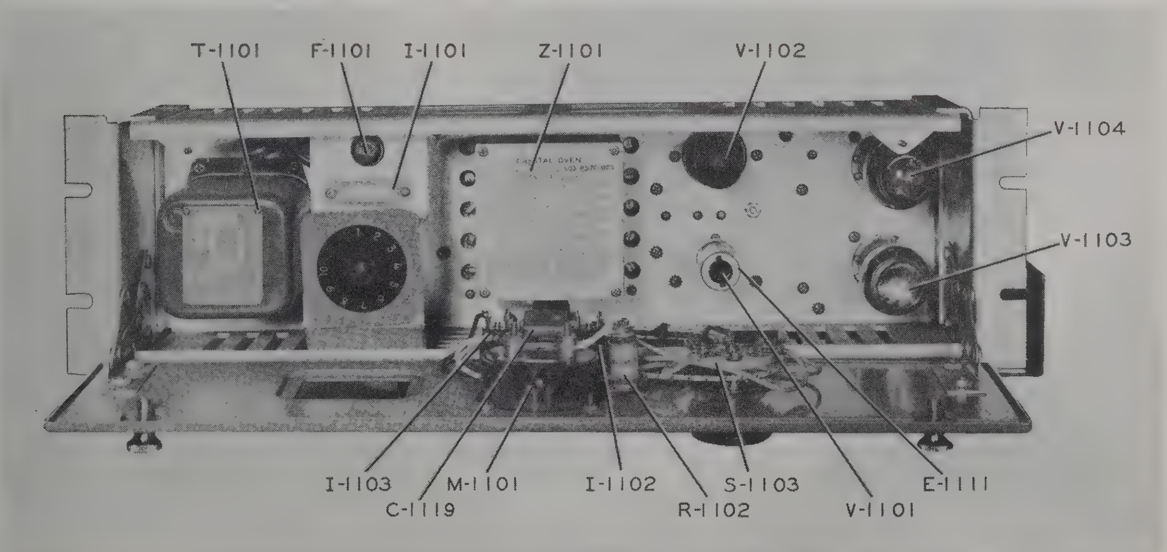


Figure 144. R-F Oscillator O-270/FRT-26, Front View, Cover Open.

either the 4 mc or the 26 mc setting of the plate tuning controls. The 4 mc setting is most likely to cause trouble. If this occurs, the resonant frequency of these trap circuits must be lowered by increasing the inductance of the coil or by increasing the capacity.

(4) No other forms of parasitic oscillation occur which are not the result of improper neutralization. Observe operation very carefully during manual keying to make certain that when the key is opened the carrier is interrupted without pips or other spurious emission. The keying circuit is subject to a minor form of transient operation which can produce a small pip following interruption of the carrier if the damping circuit is not effective. If such pips are observed, check R-569 and C-505 across the keyer output.

r. Adjustment of Vacuum Tube Voltmeters Z-515, Z-516, Z-1507, and Z-1508.

(1) Tune the transmitter for 4-mc operation.

(2) Turn **POWER AMP. LOADING** Control $\boxed{\text{E}}$ on Radio Transmitter T-454/FRT-26 to minimum coupling.

(3) With the intermediate power amplifier lightly loaded, adjust voltmeters Z-515 and Z-516 so that both meter readings are equal and about 0.9 times the IPA plate voltage.

(4) By operating the **POWER AMP. LOADING** Control $\boxed{\text{E}}$, adjust the drive to the power amplifier to its optimum value.

(5) With the Power Amplifier lightly loaded, adjust voltmeters Z-1507 and Z-1508 so that both meter readings are equal and about 0.9 times the PA plate voltage.

Note. In the keyed photographs that follow, if an individual leader is used to indicate a series of several components, the symbol numbers of those components are listed in consecutive order from left to right, from top to bottom, or from nearest to farthest, as regards the location of the components with respect to the camera. Dashed leaders indicate the locations of hidden components. Fuse holders, lamp sockets, tube sockets, crystal sockets, and plug-in crystal-oven sockets carry the same symbol numbers as the components which mount in them, preceded by the letter X.

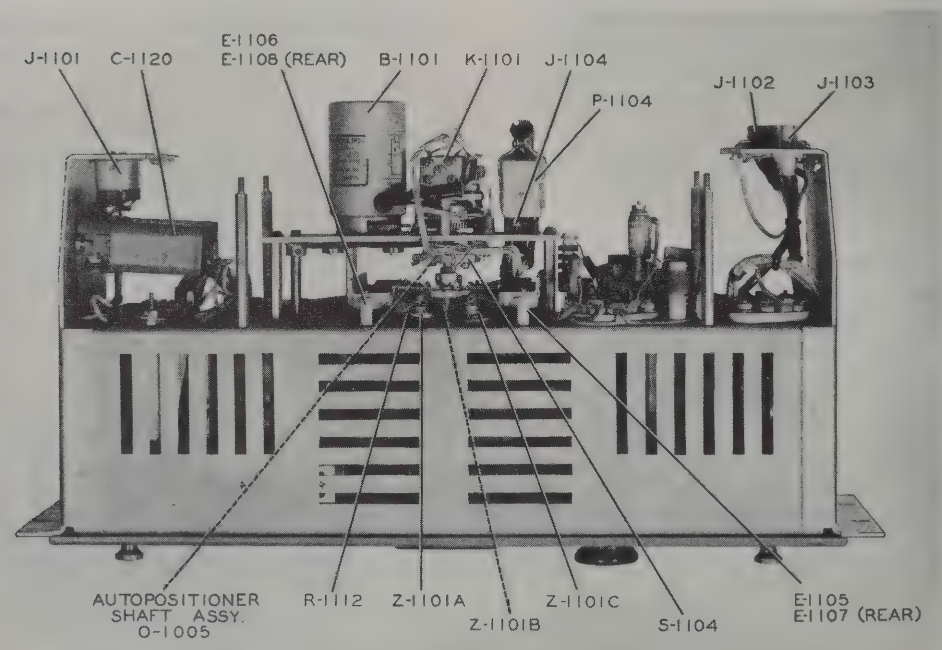


Figure 145. R-F Oscillator O-270/FRT-26, Top View, Covers Removed.

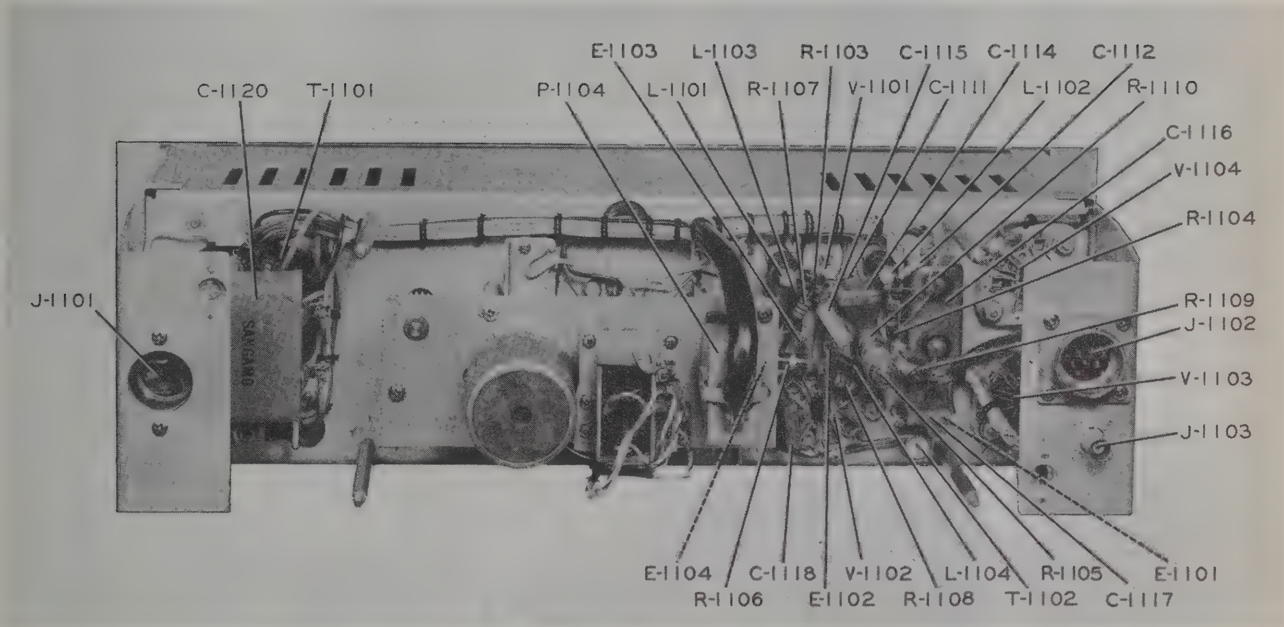


Figure 146. R-F Oscillator O-270/FRT-26, Rear View, Covers Removed.

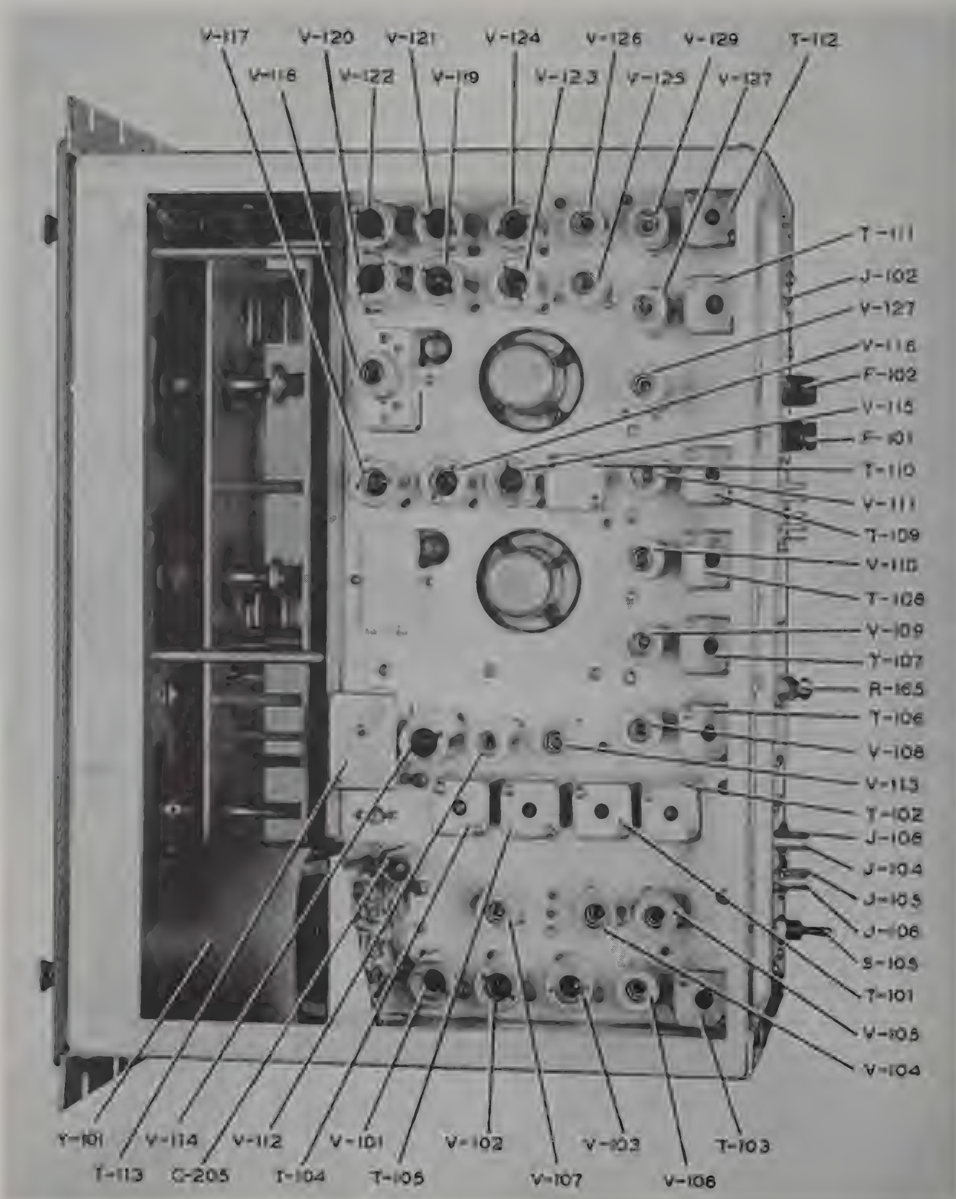


Figure 147. R-F Oscillator O-91/FRT-5, Top View, Cover Removed.

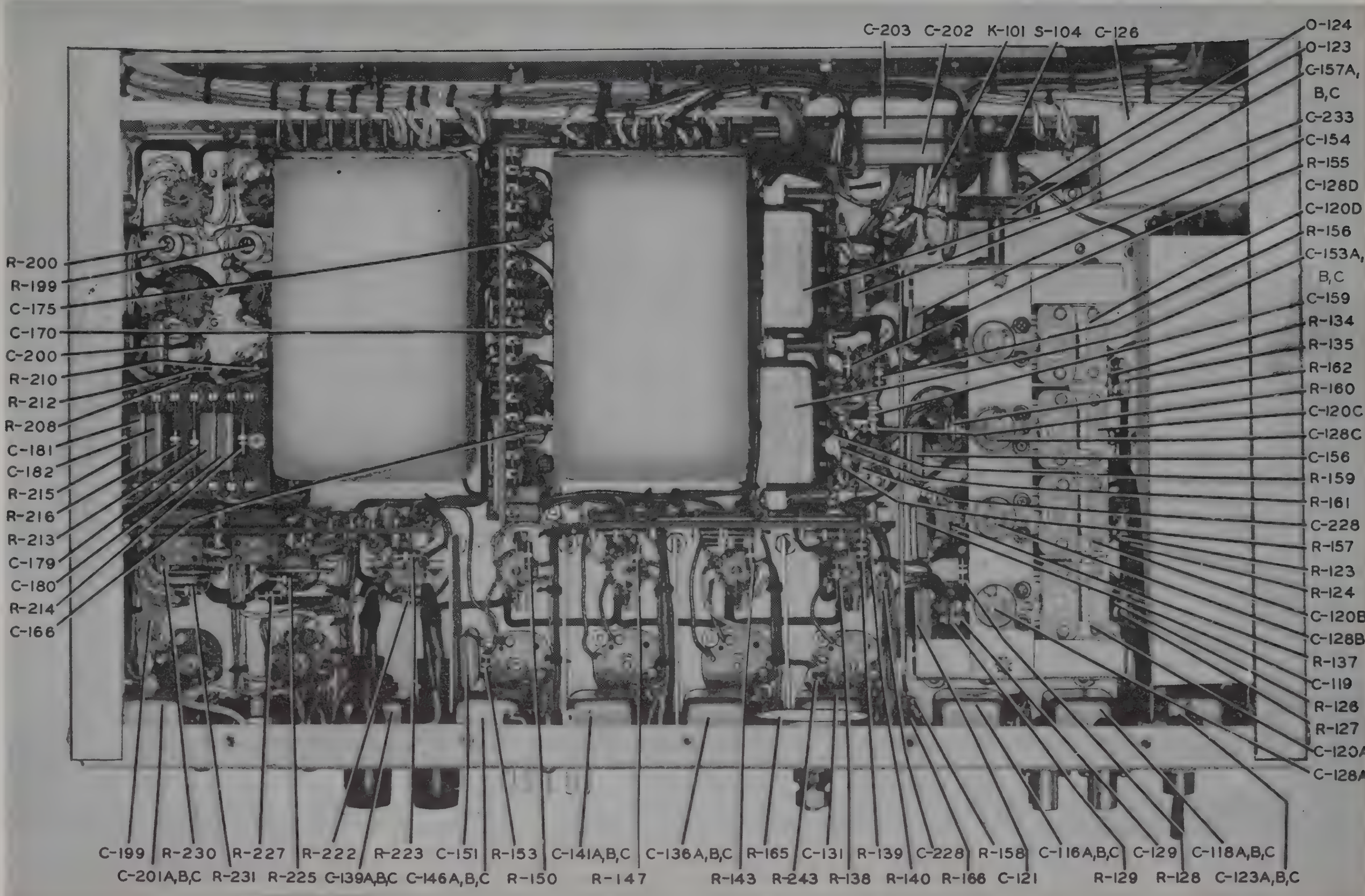


Figure 148. R-F Oscillator O-91/FRT-5, Bottom View, Cover Removed.

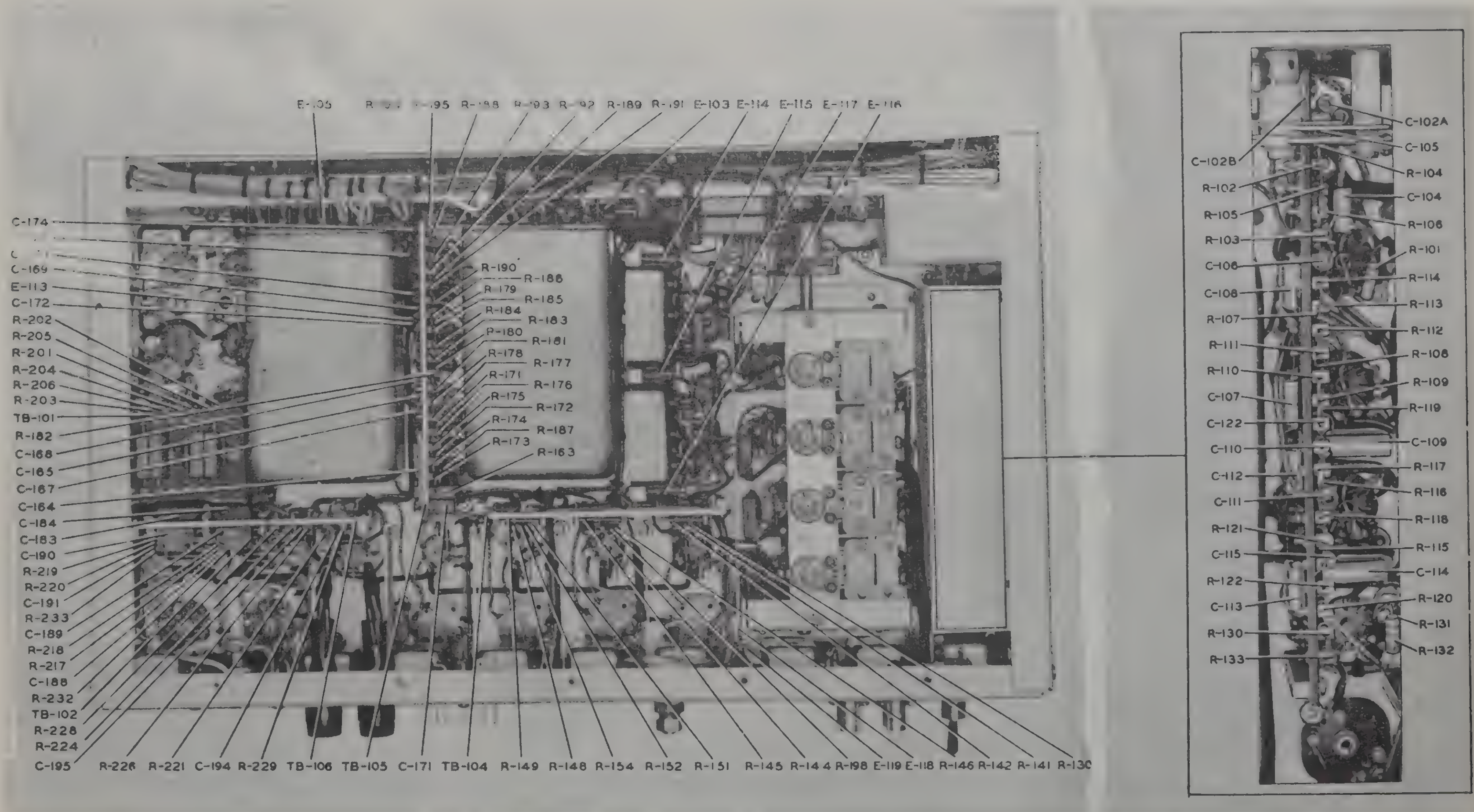


Figure 149. R-F Oscillator O-91/FRT-5, Bottom View, Parts Shown in Figure 148.

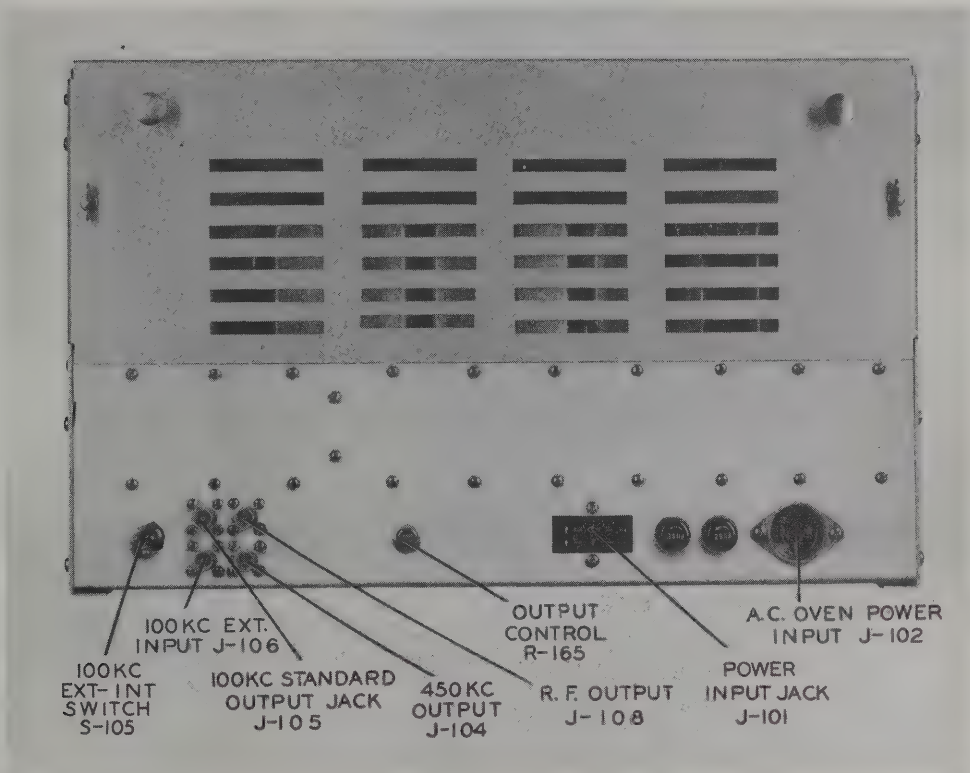


Figure 150. R-F Oscillator O-91/FRT-5, Rear View.

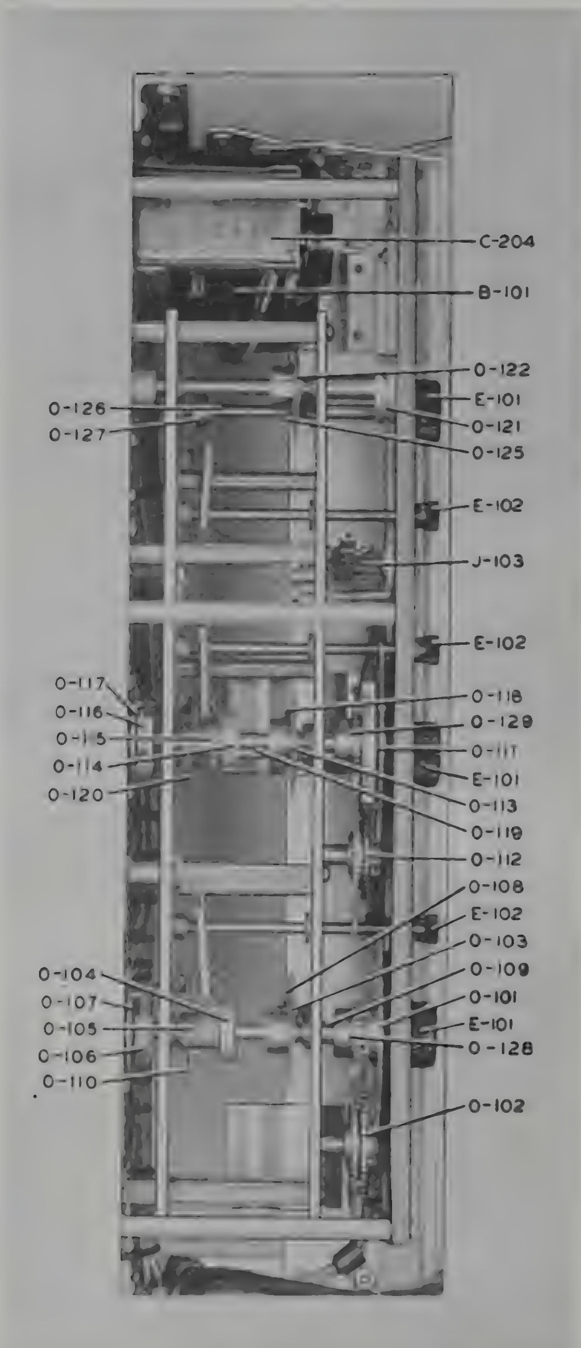


Figure 151. R-F Oscillator O-91/FRT-5, Dial Gears.

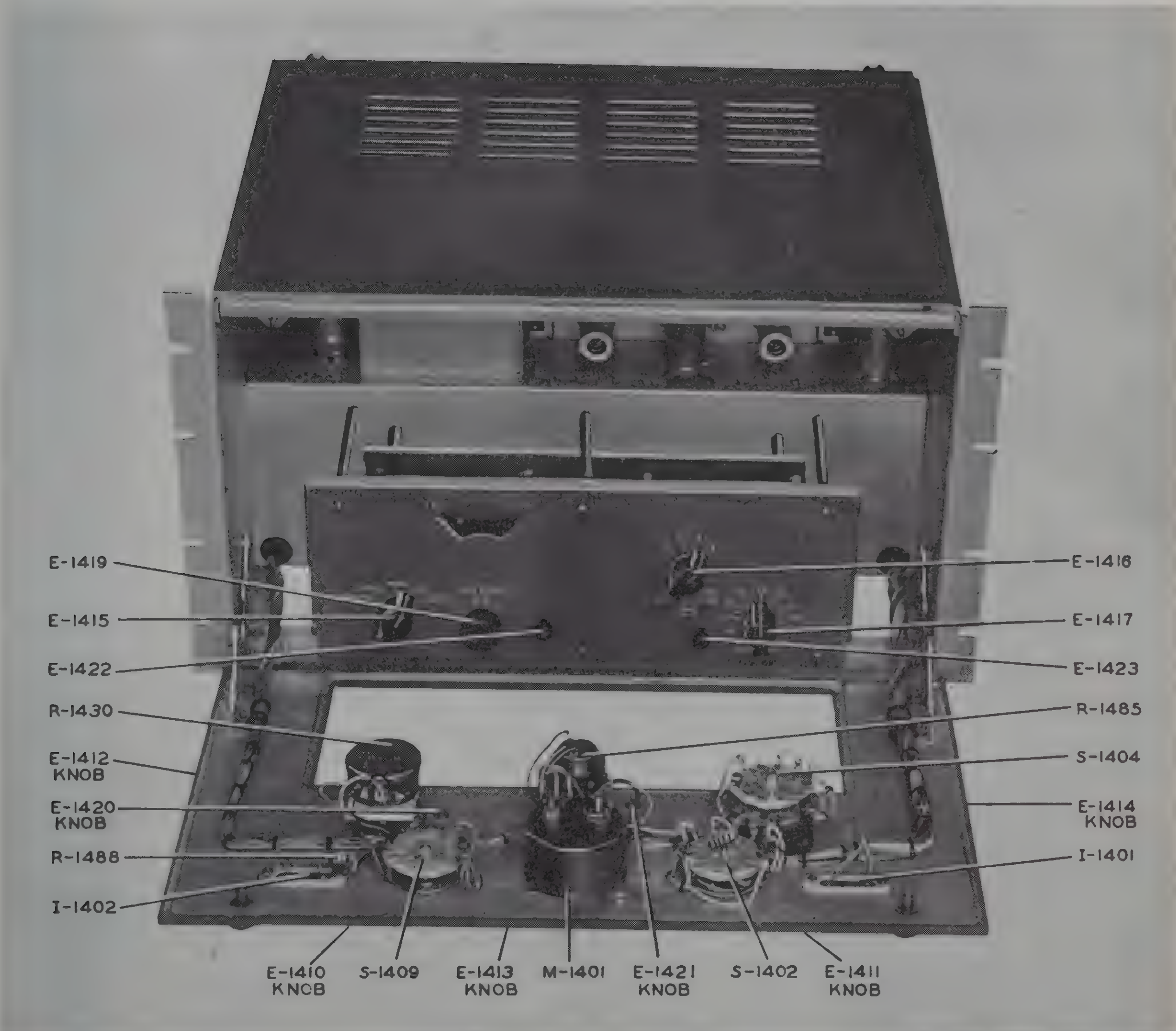


Figure 152. Frequency-Shift Keyer KY-45/FRT-5, Front View, Panel Open.

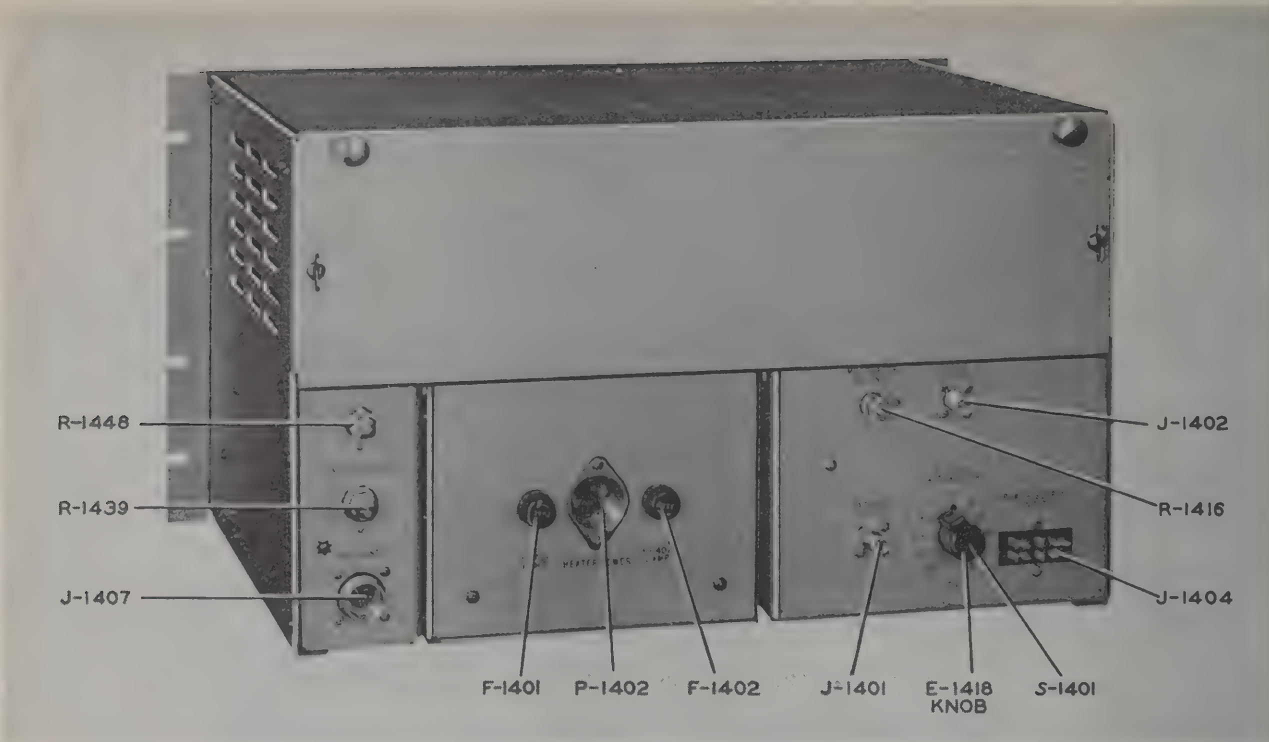


Figure 153. Frequency-Shift Keyer KY-45/FRT-5, Rear View.

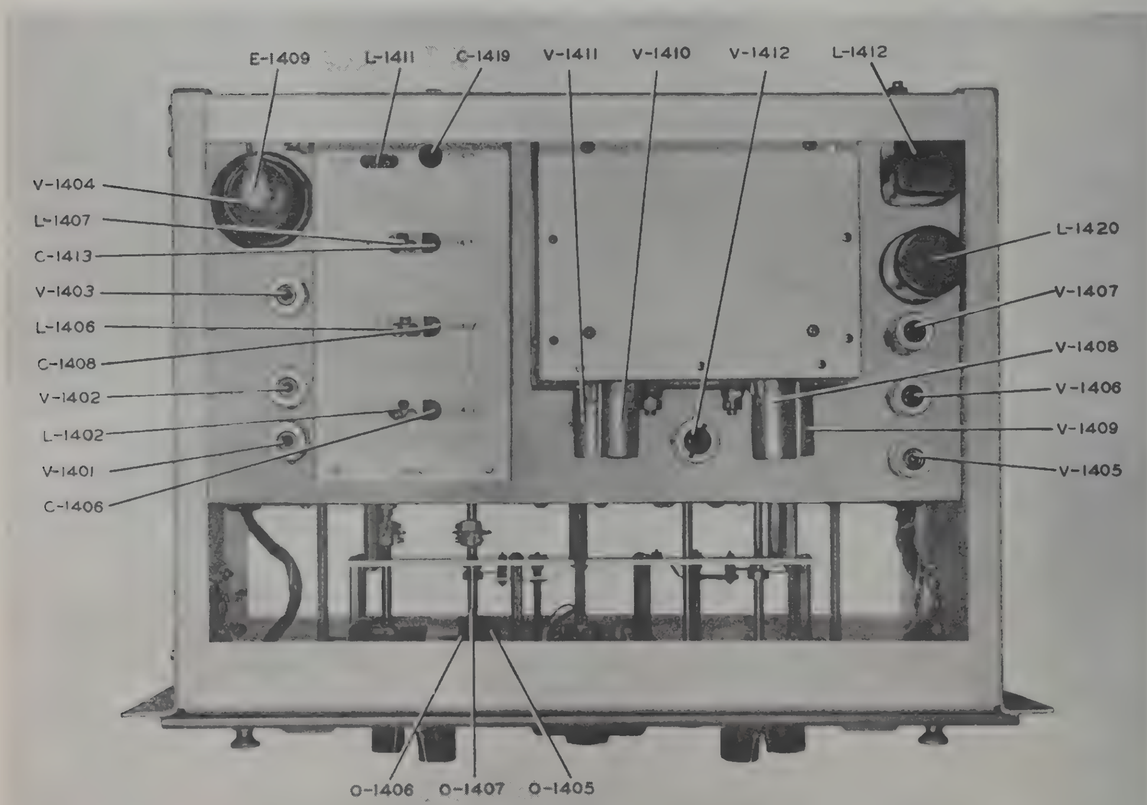


Figure 154. Frequency-Shift Keyer KY-45/FRT-5, Top View, Cover Removed.

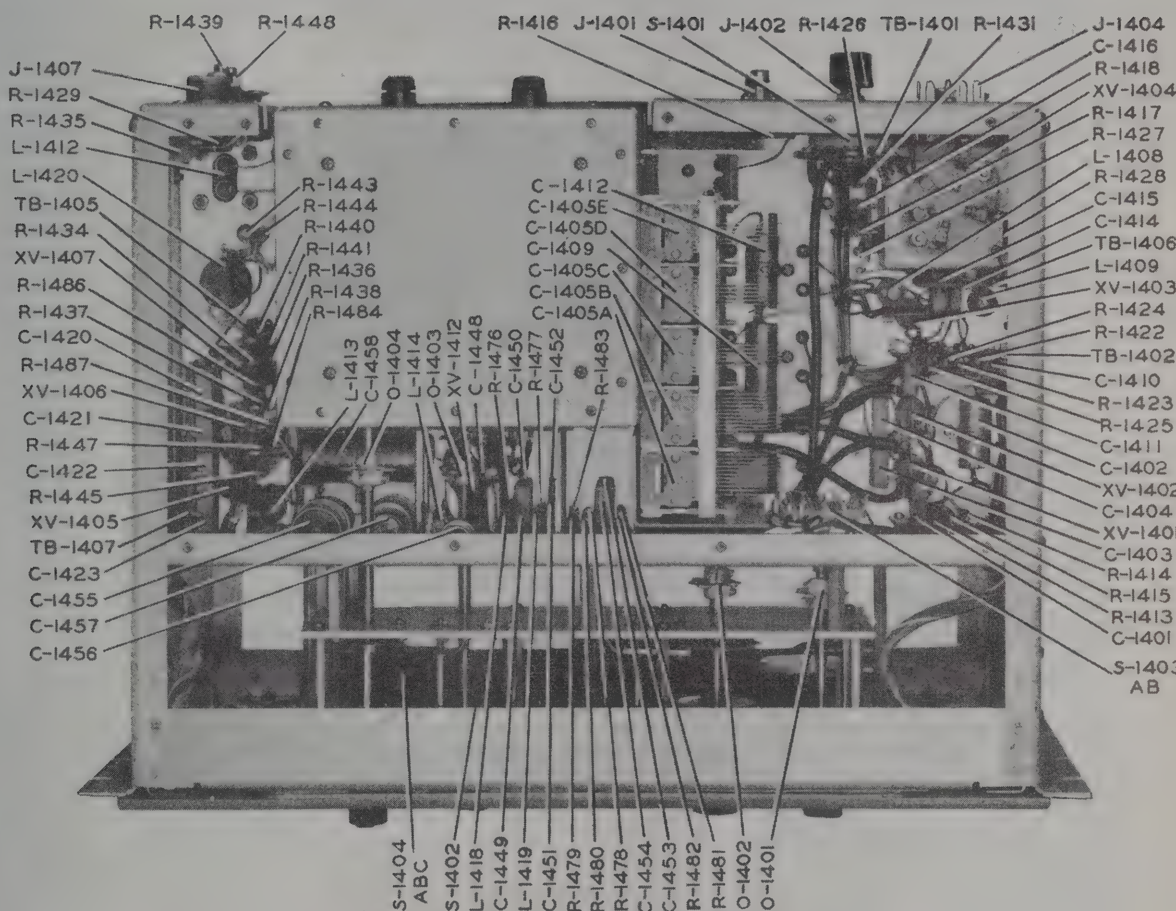


Figure 155. Frequency-Shift Keyer KY-45/FRT-5, Bottom View, Cover Removed.

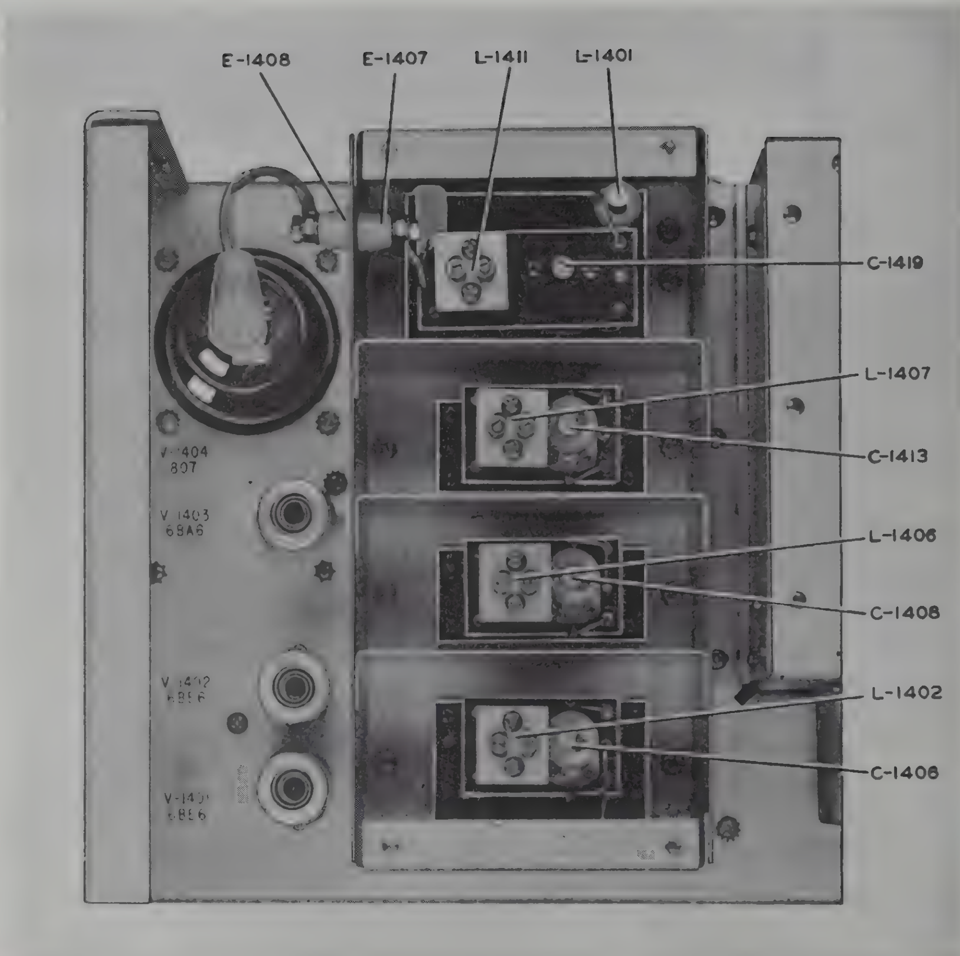


Figure 156. Frequency-Shift Keyer KY-45/FRT-5, Plate-Circuit Coil Enclosure, Cover Removed.

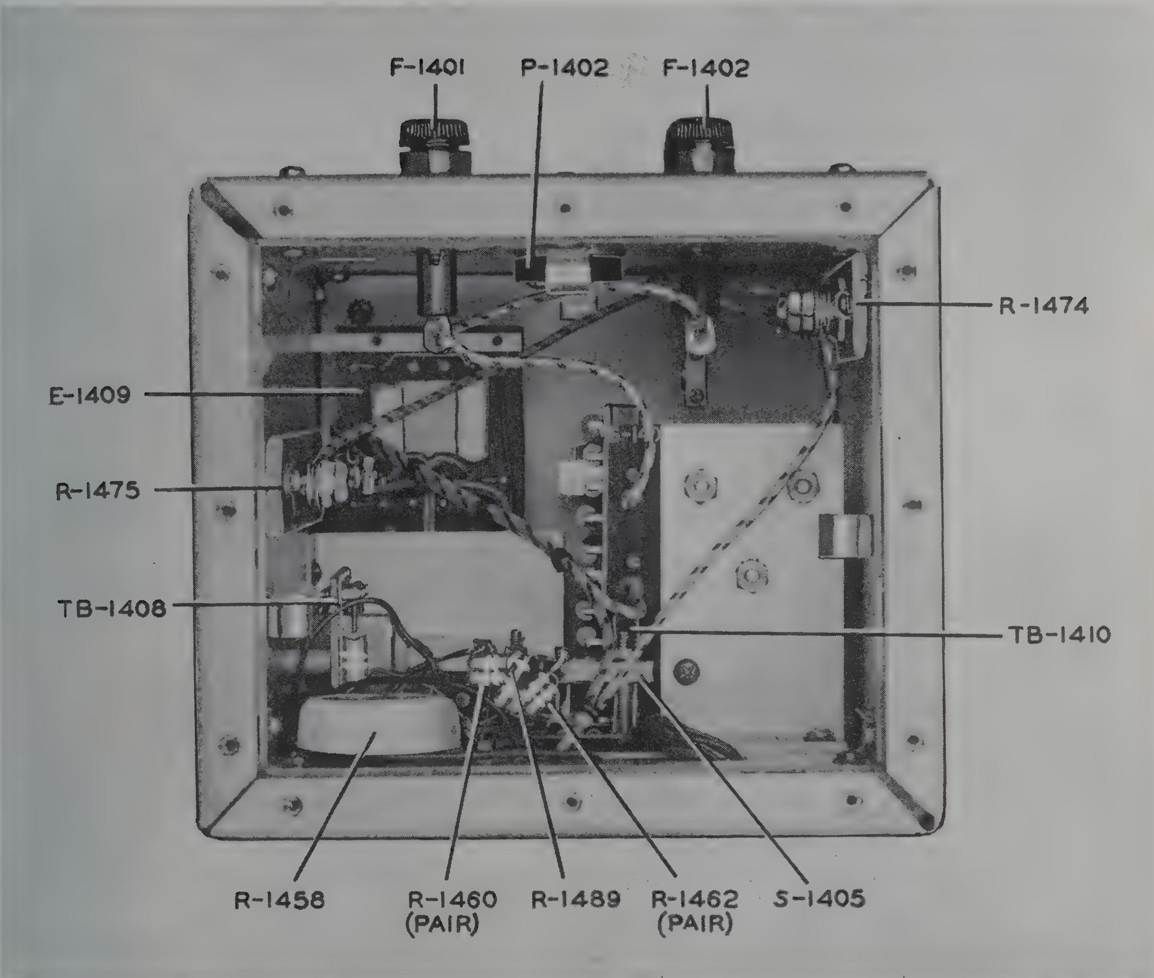


Figure 157. Frequency-Shift Keyer KY-45/FRT-5, Oven Assembly, Top View.

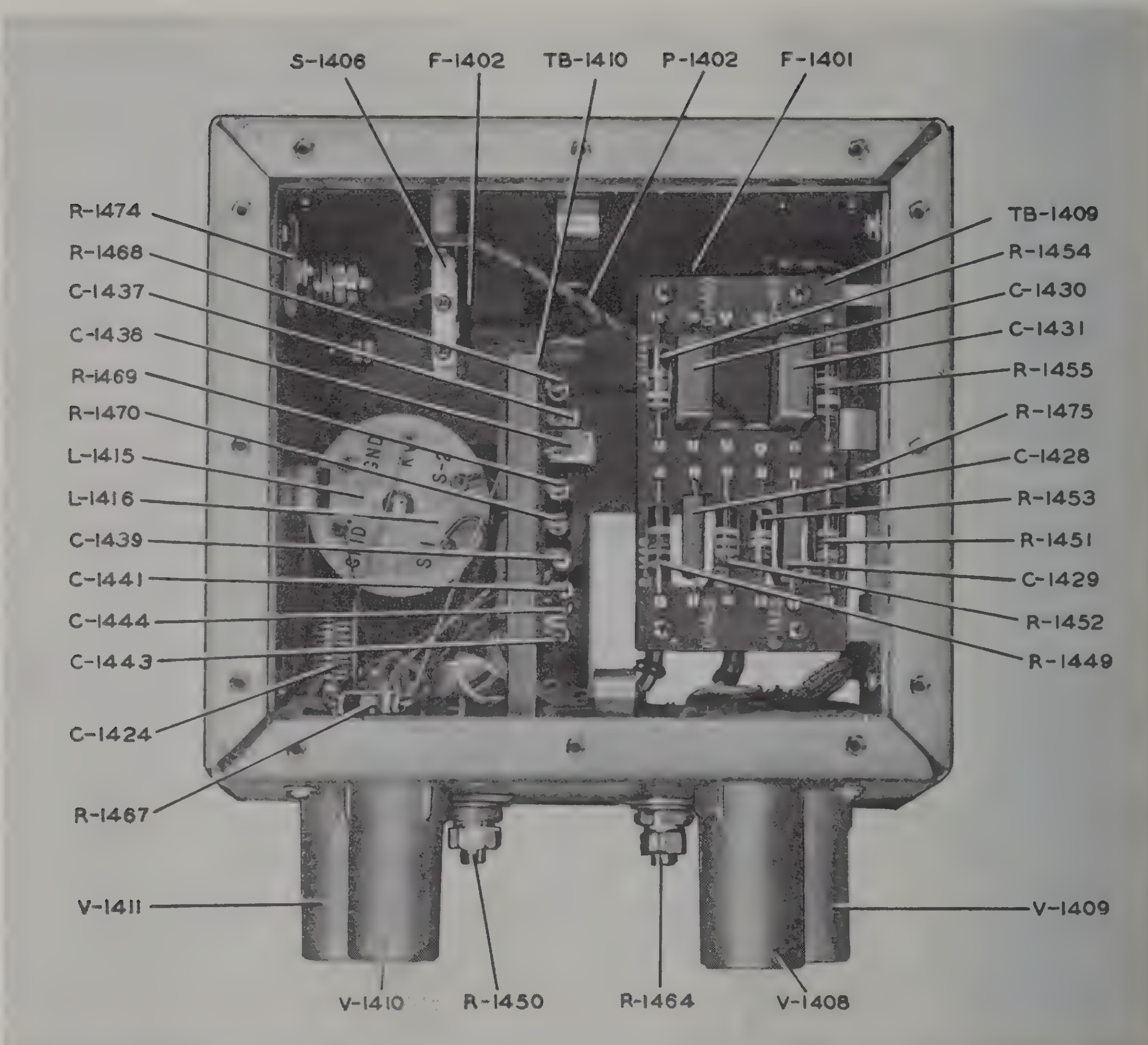


Figure 158. Frequency-Shift Keyer KY-45/FRT-5, Oven Assembly, Bottom View.

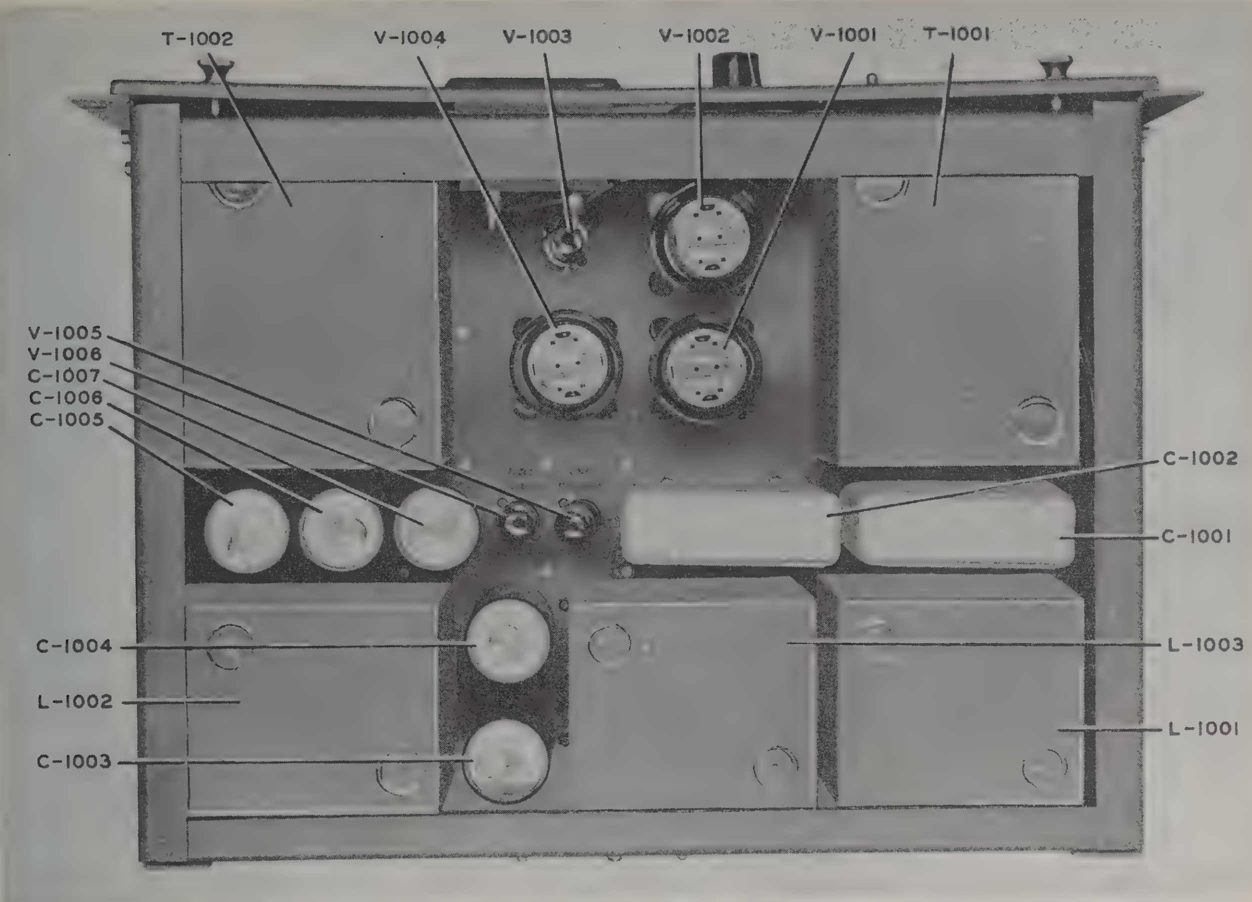


Figure 159. Power Supply PP-454/FRT-5, Top View.

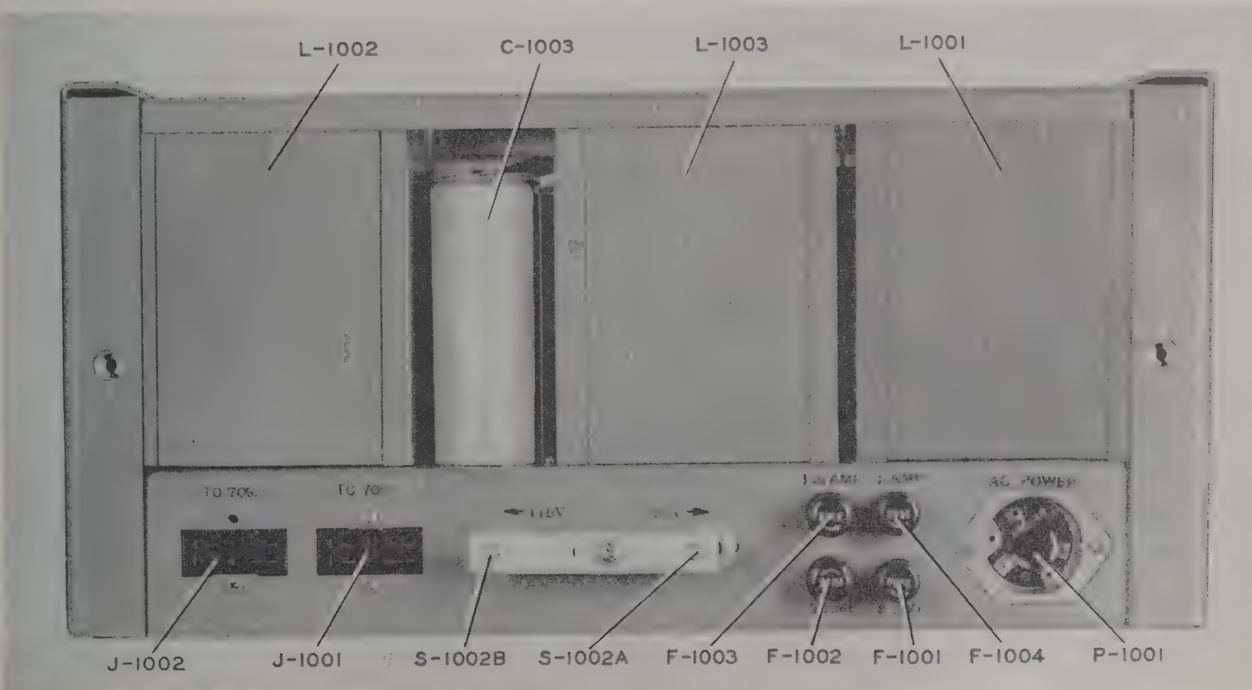


Figure 160. Power Supply PP-454/FRT-5, Rear View.

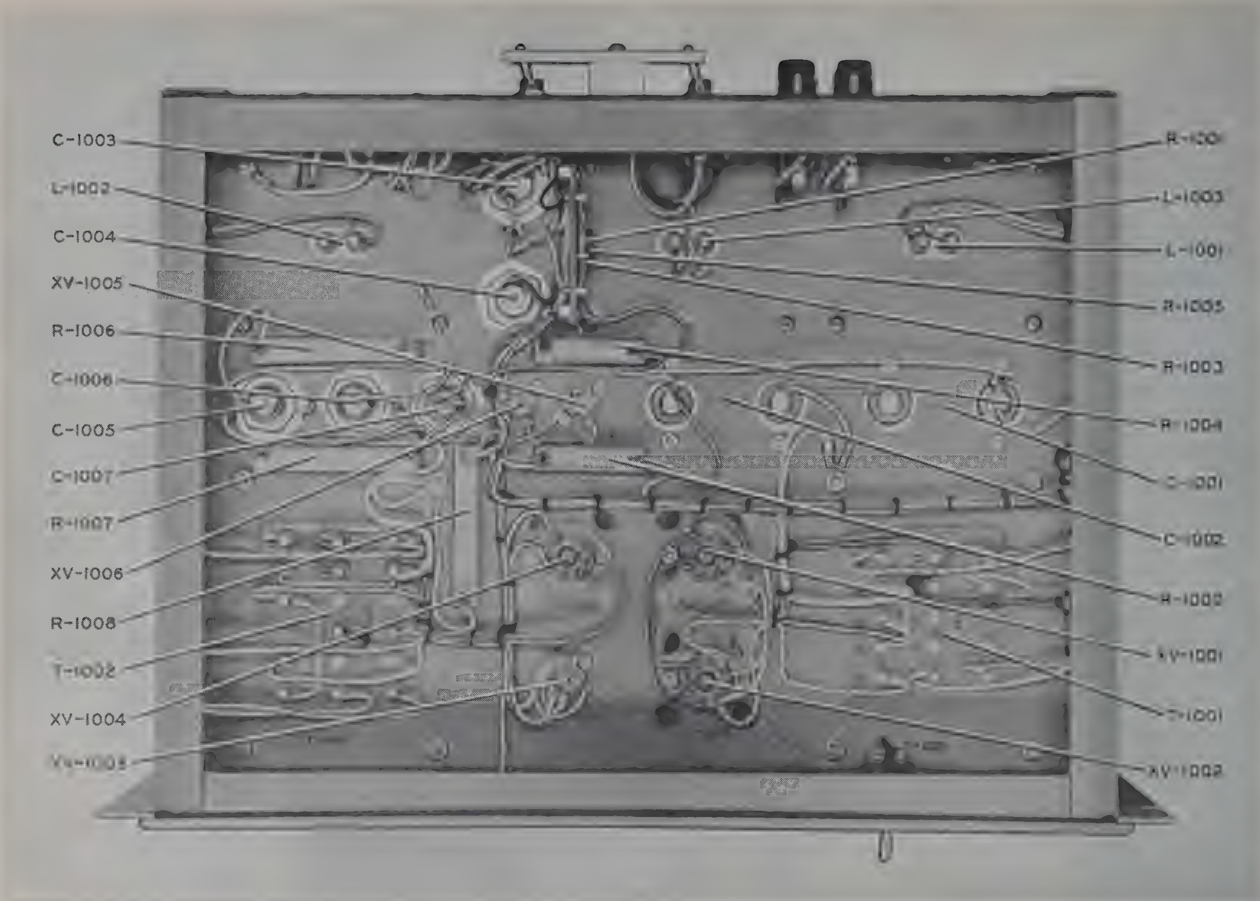


Figure 161. Power Supply PP-454/FRT-5, Bottom View.

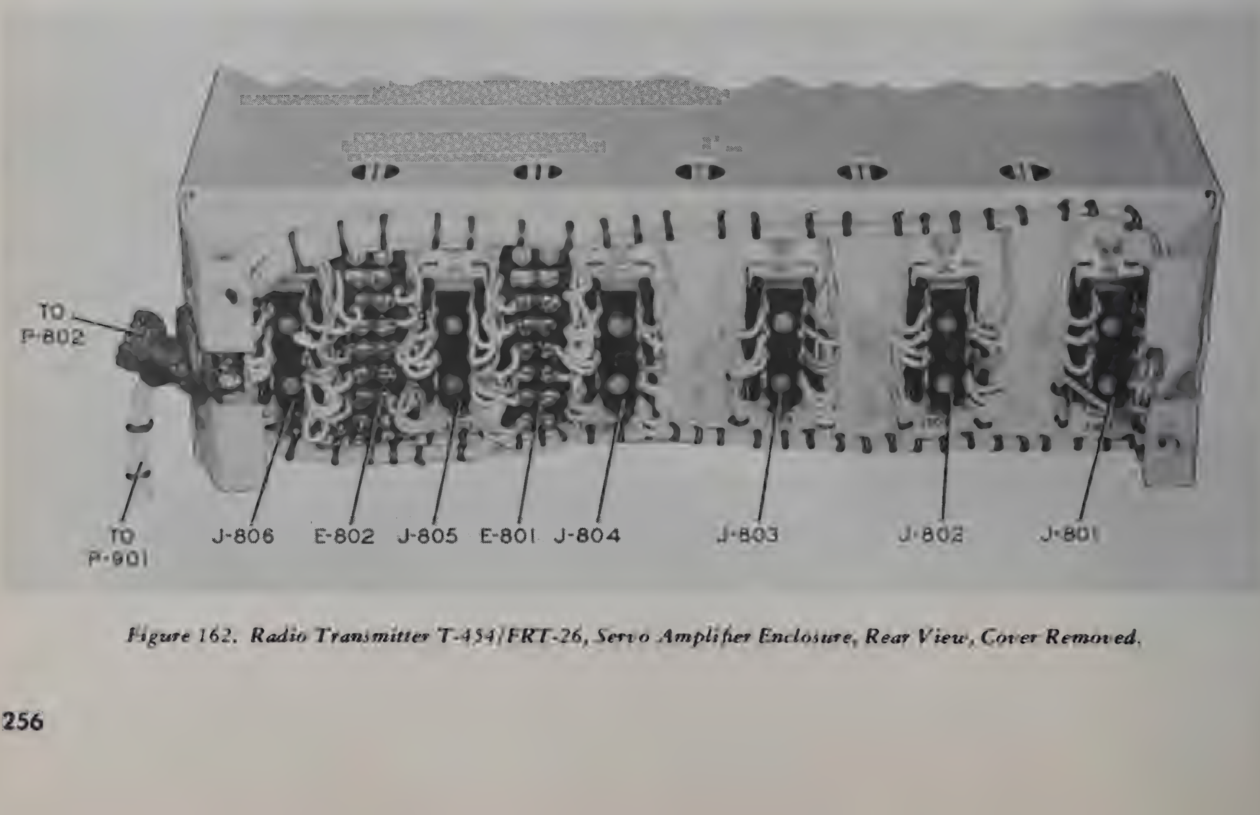


Figure 162. Radio Transmitter T-454/FRT-26, Servo Amplifier Enclosure, Rear View, Cover Removed.

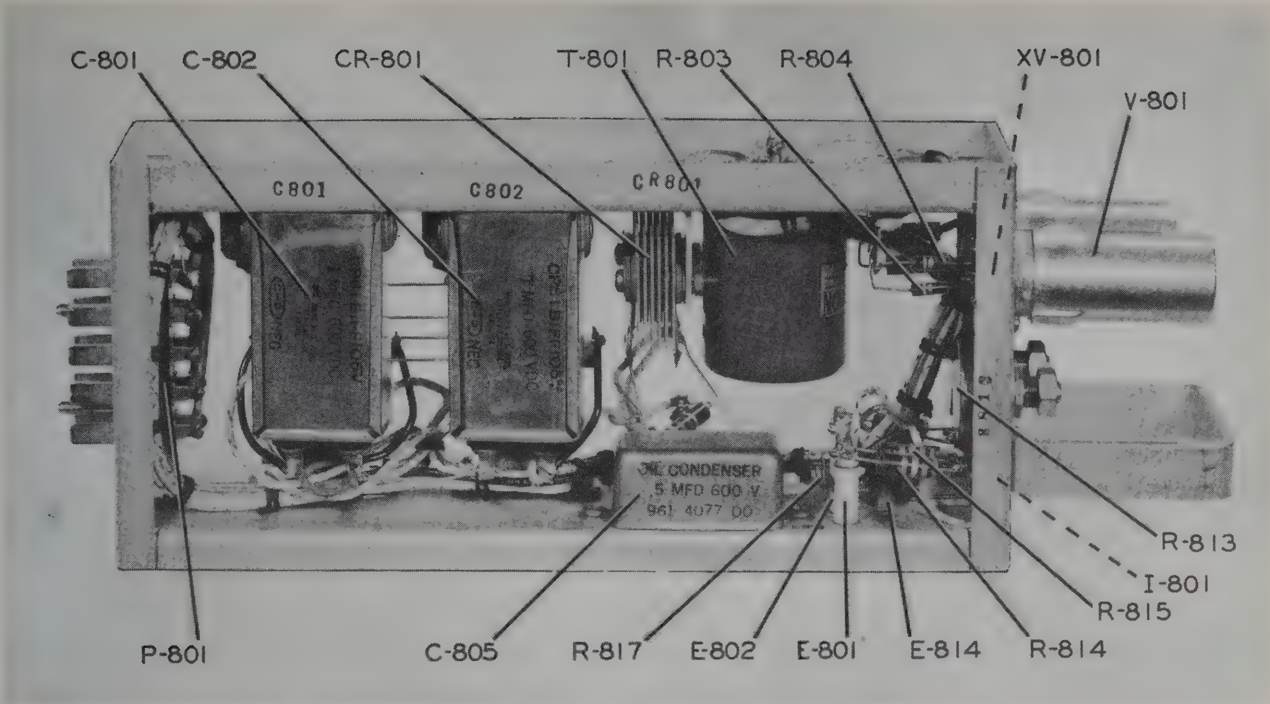


Figure 163. Servo Amplifier, Left Side View.

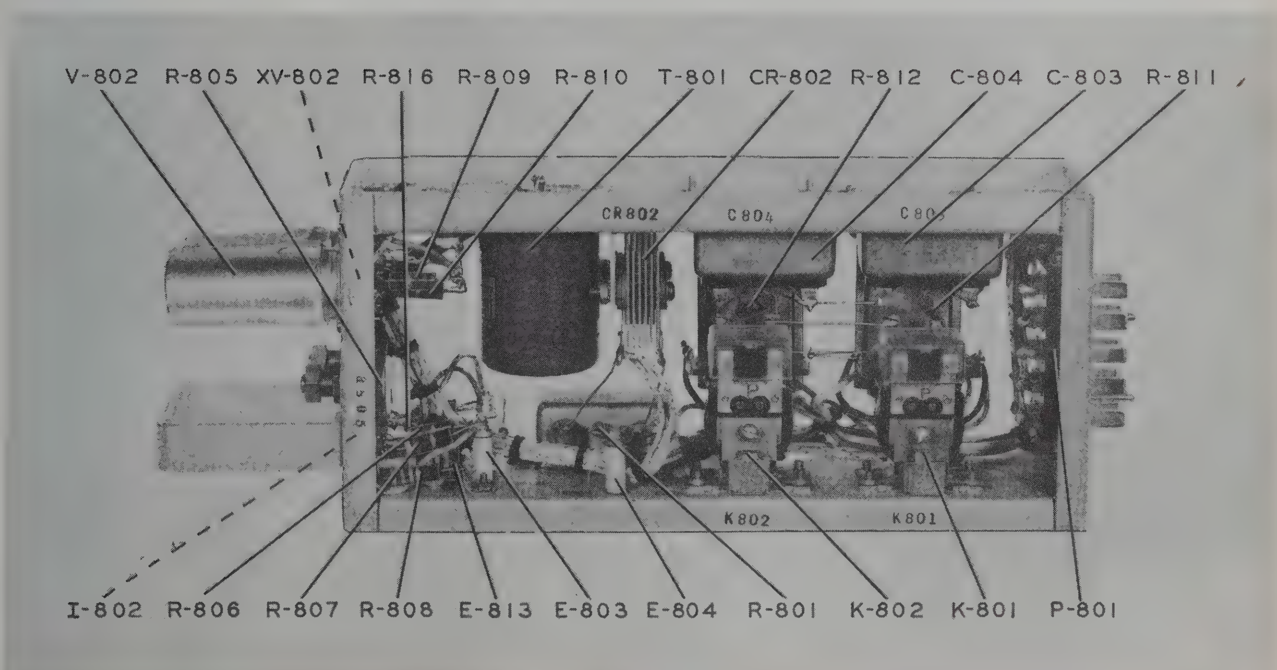


Figure 164. Servo Amplifier, Right Side View.

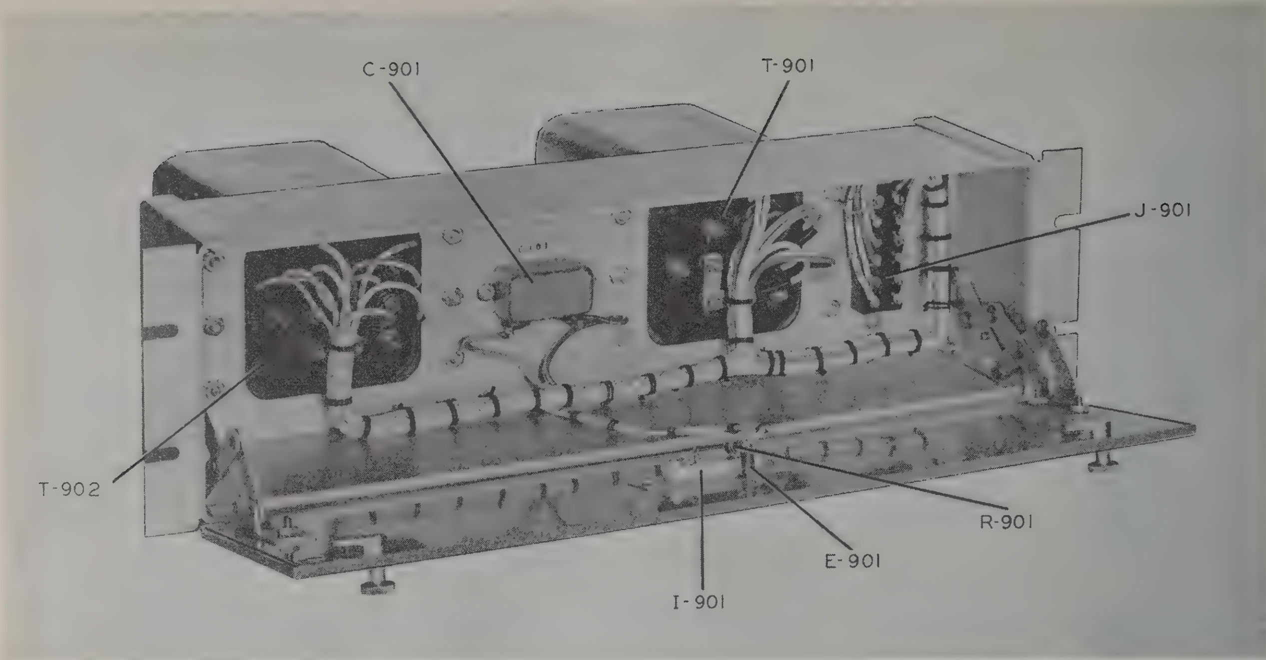


Figure 165. Servo Power Supply, Front View, Cover Open.

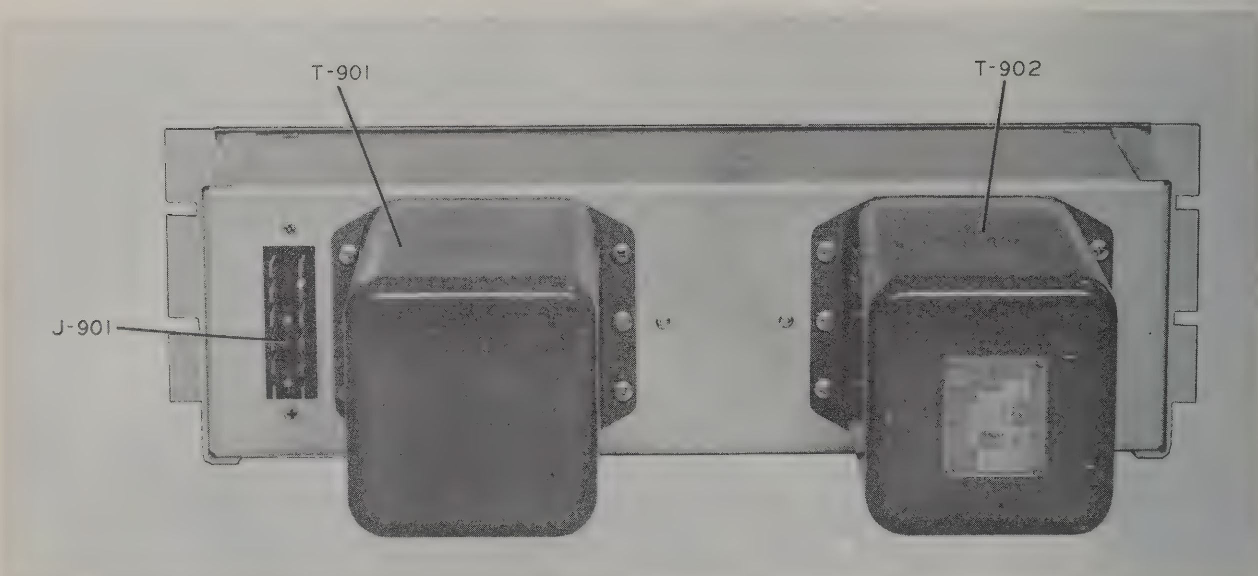


Figure 166. Servo Power Supply, Rear View, Cover Removed.

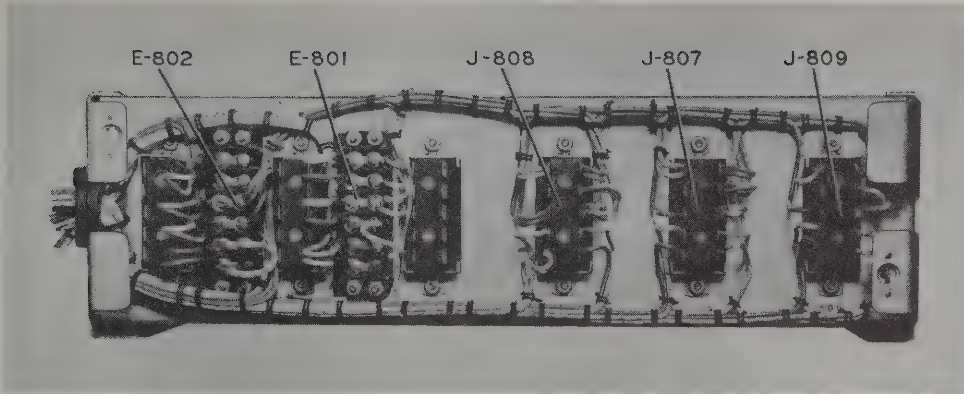


Figure 167. R-F Amplifier AM-738/FRT-22, Servo Amplifier Enclosure, Rear View, Cover Removed.

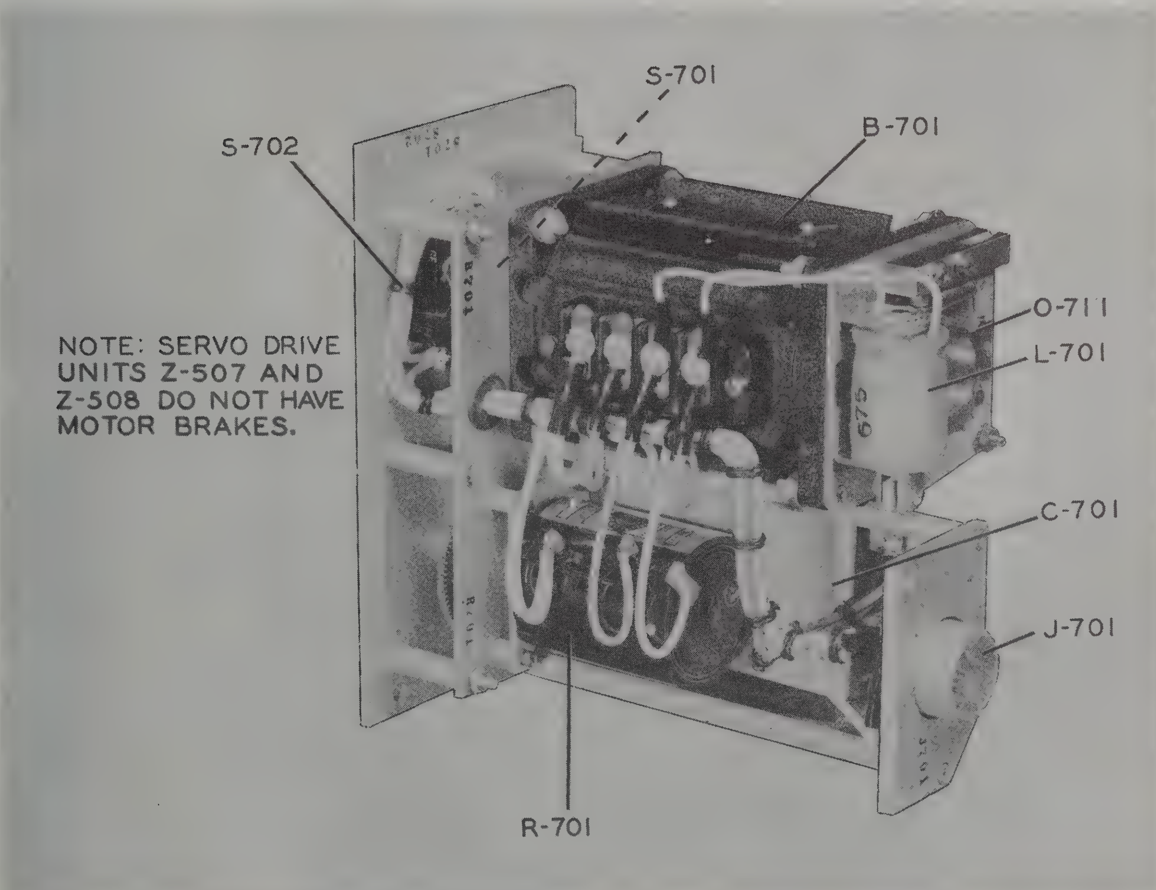


Figure 168. Typical Servo Drive Unit.

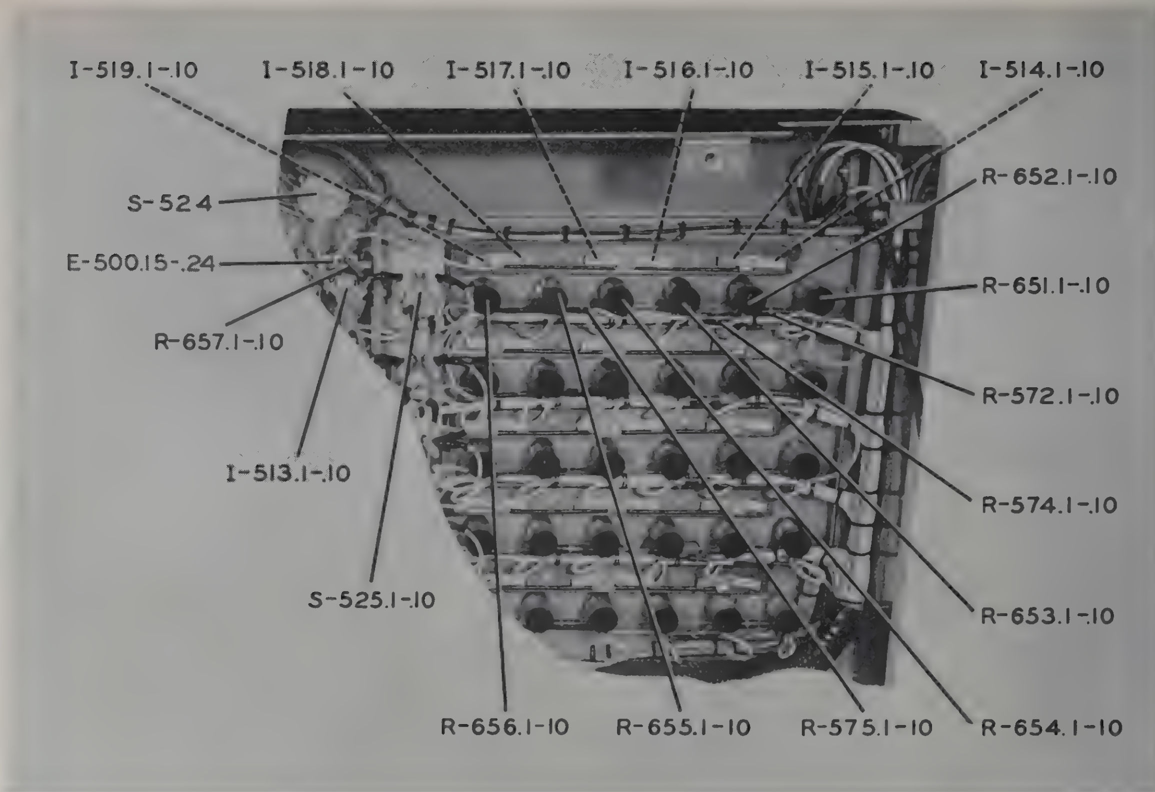


Figure 169. Radio Transmitter T-454/FRT-26, Preset Tuning Control Panel, Rear View.

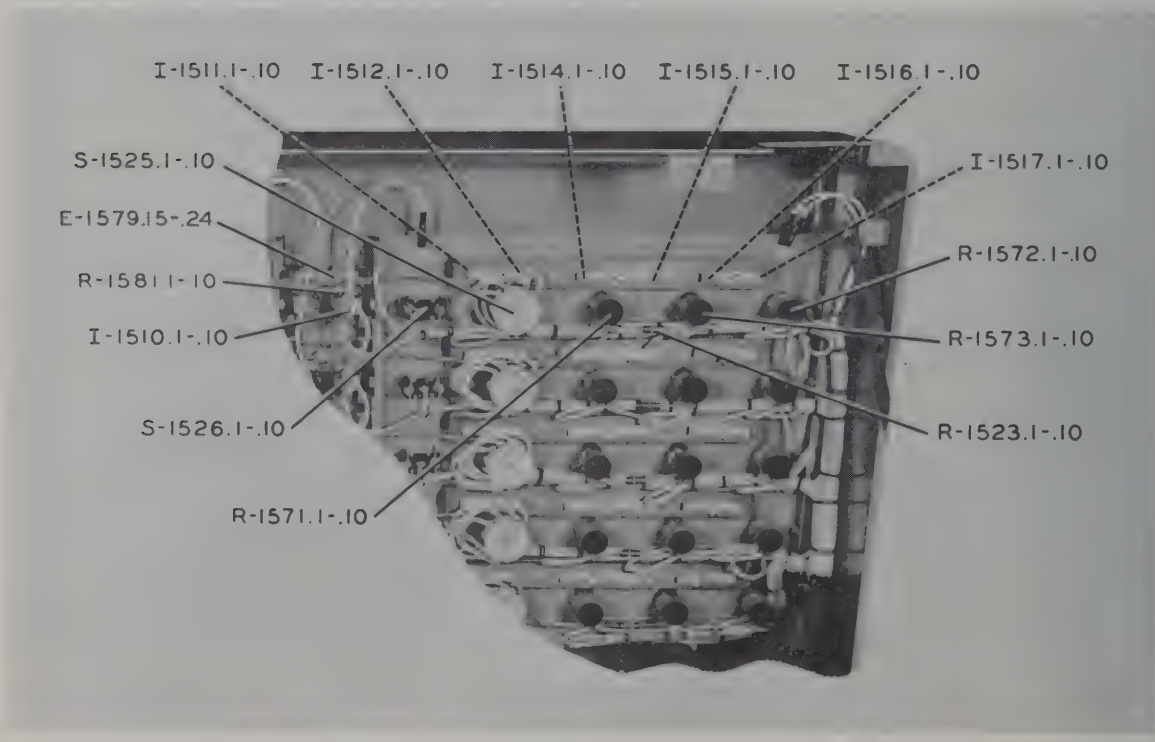


Figure 170. R-F Amplifier AM-738/FRT-22, Preset Tuning Control Panel, Rear View.

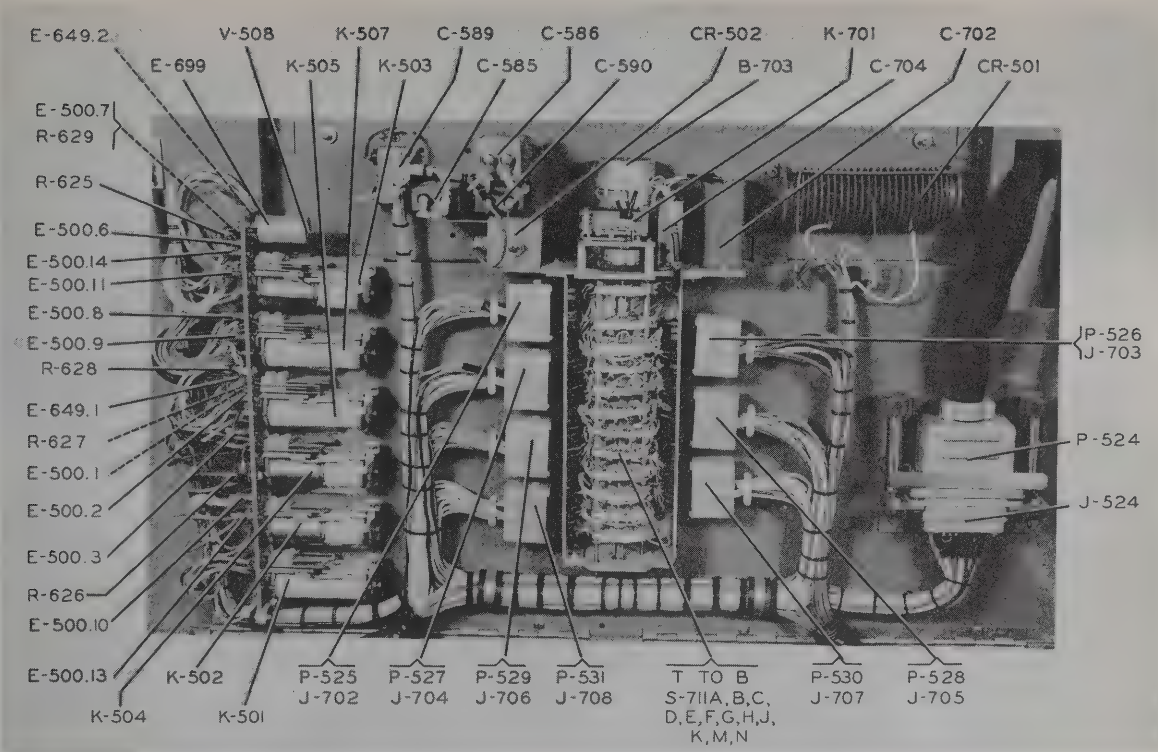


Figure 171. Radio Transmitter T-454/FRT-26, Preset Tuning Control Subpanel.

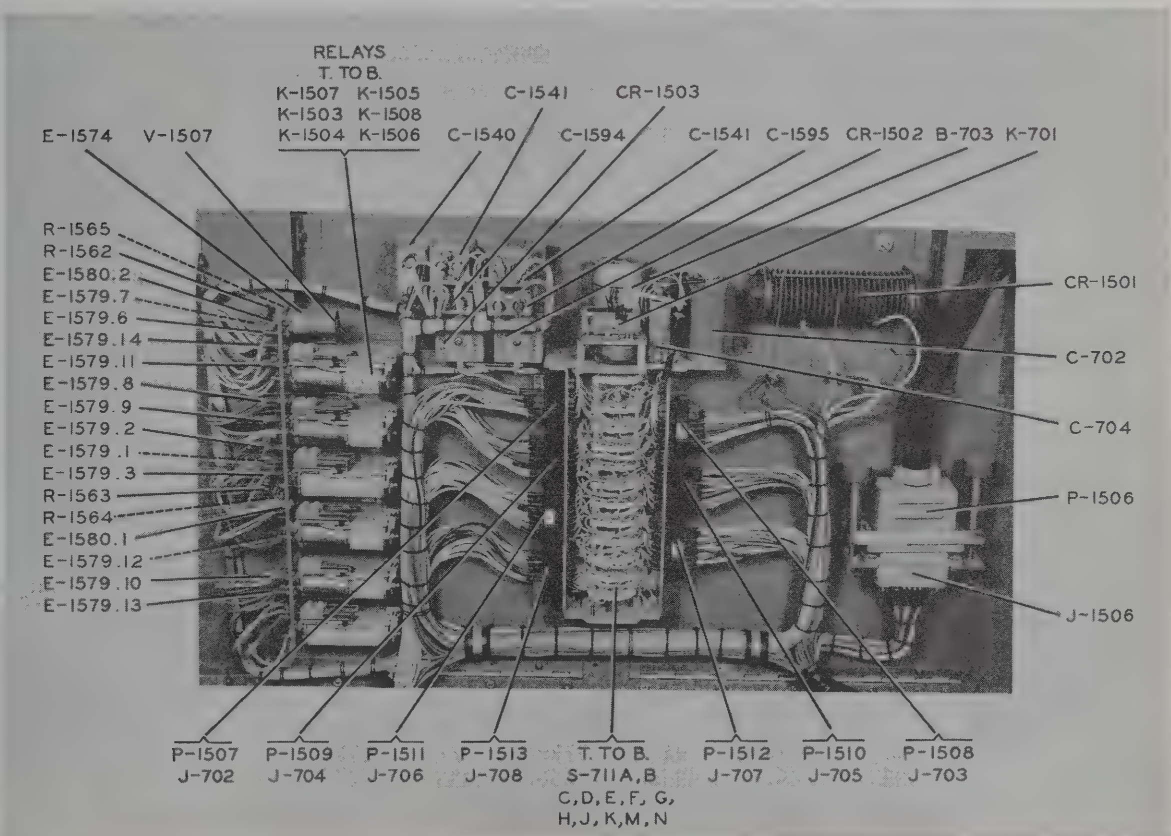


Figure 172. R-F Amplifier AM-738/FRT-22, Preset Tuning Control Subpanel.

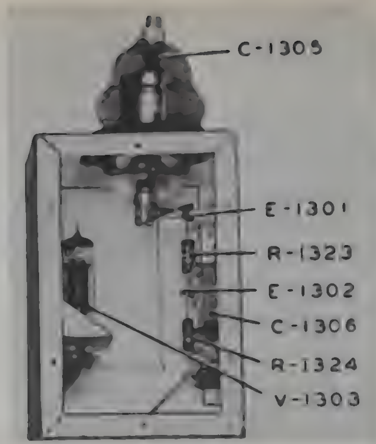


Figure 173. Vacuum-Tube Voltmeters Z-513, Z-514, Z-1505, and Z-1506.

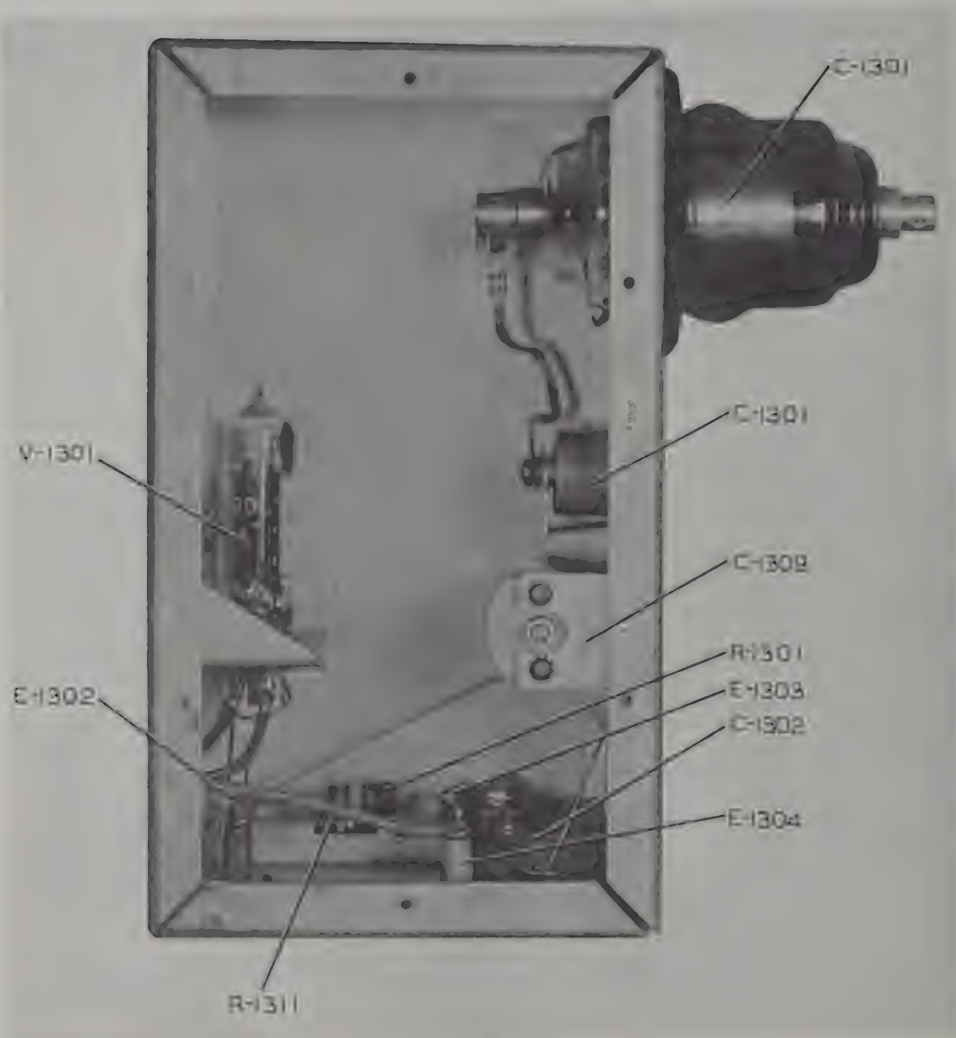


Figure 174. Vacuum-Tube Voltmeters Z-515, Z-516, Z-1507, and Z-1508.

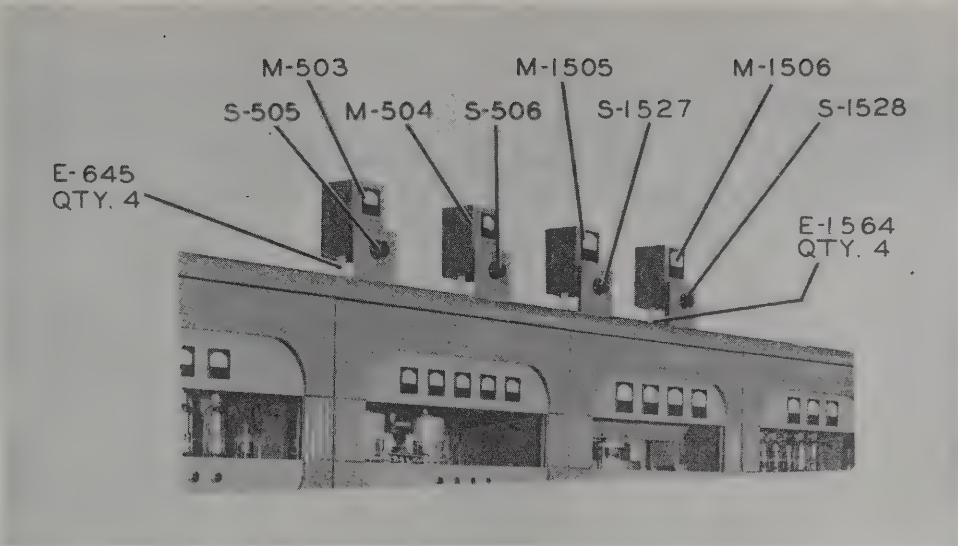


Figure 175. Antenna Current Meters.

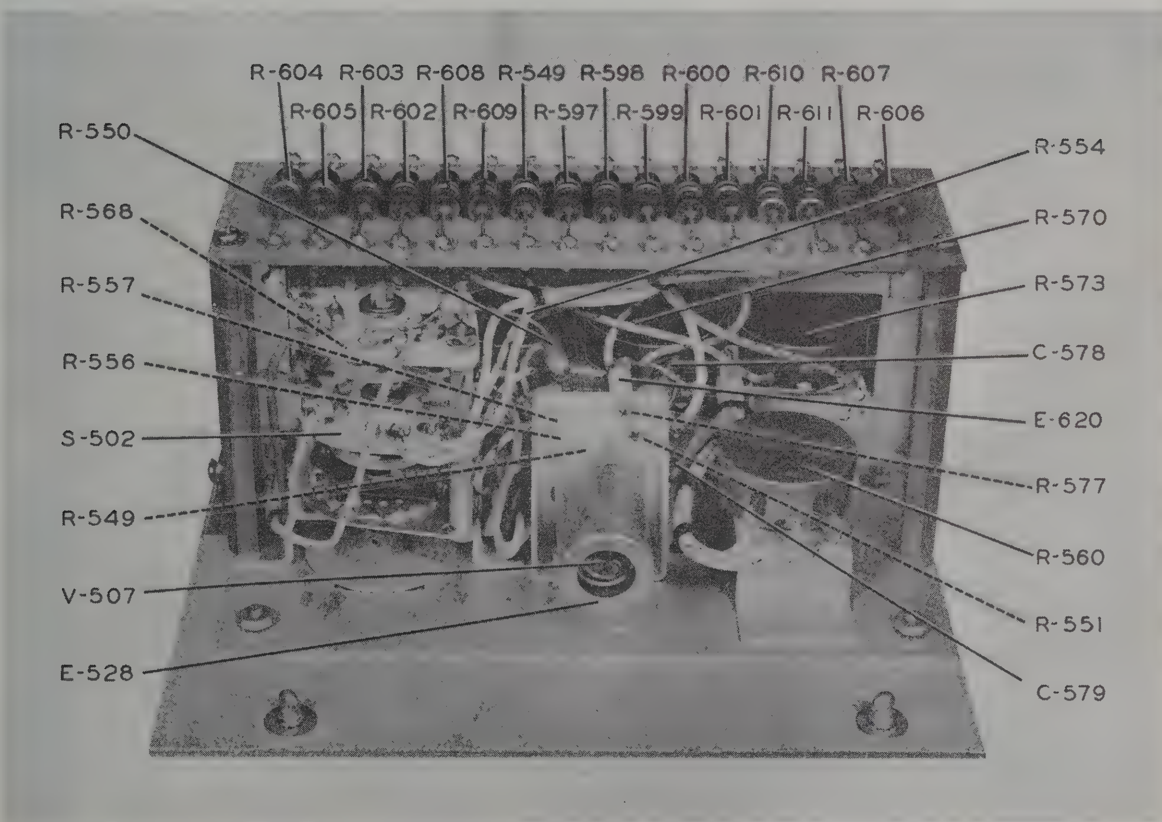


Figure 176. Radio Transmitter T-454/FRT-26, Electronic Keyer.

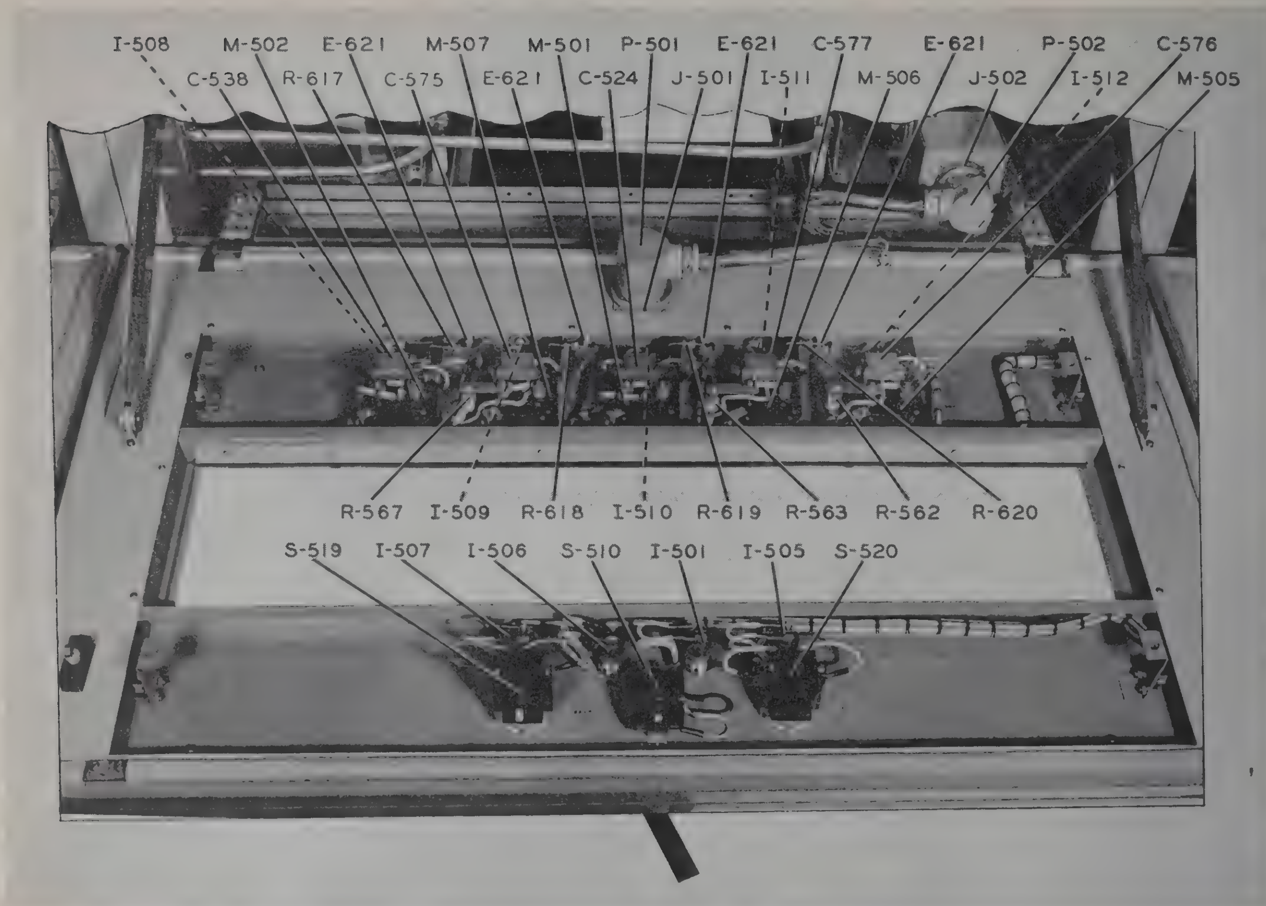


Figure 177. Radio Transmitter T-454/FRT-26, Upper Front Panel, Rear View.

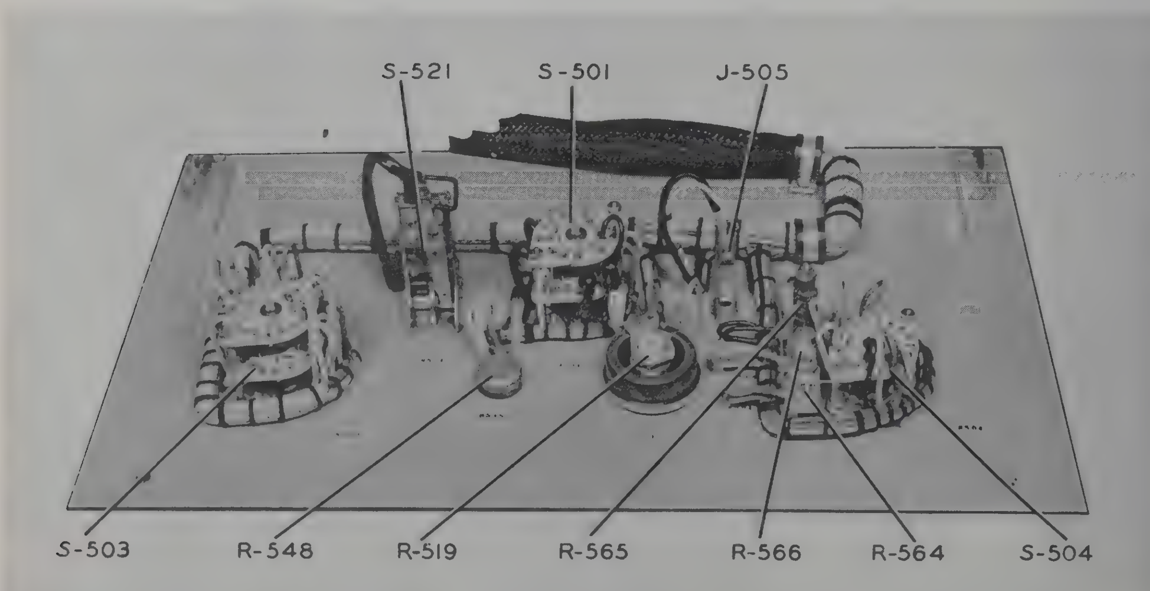


Figure 178. Radio Transmitter T-454/FRT-26, Lower Control Panel, Rear View.

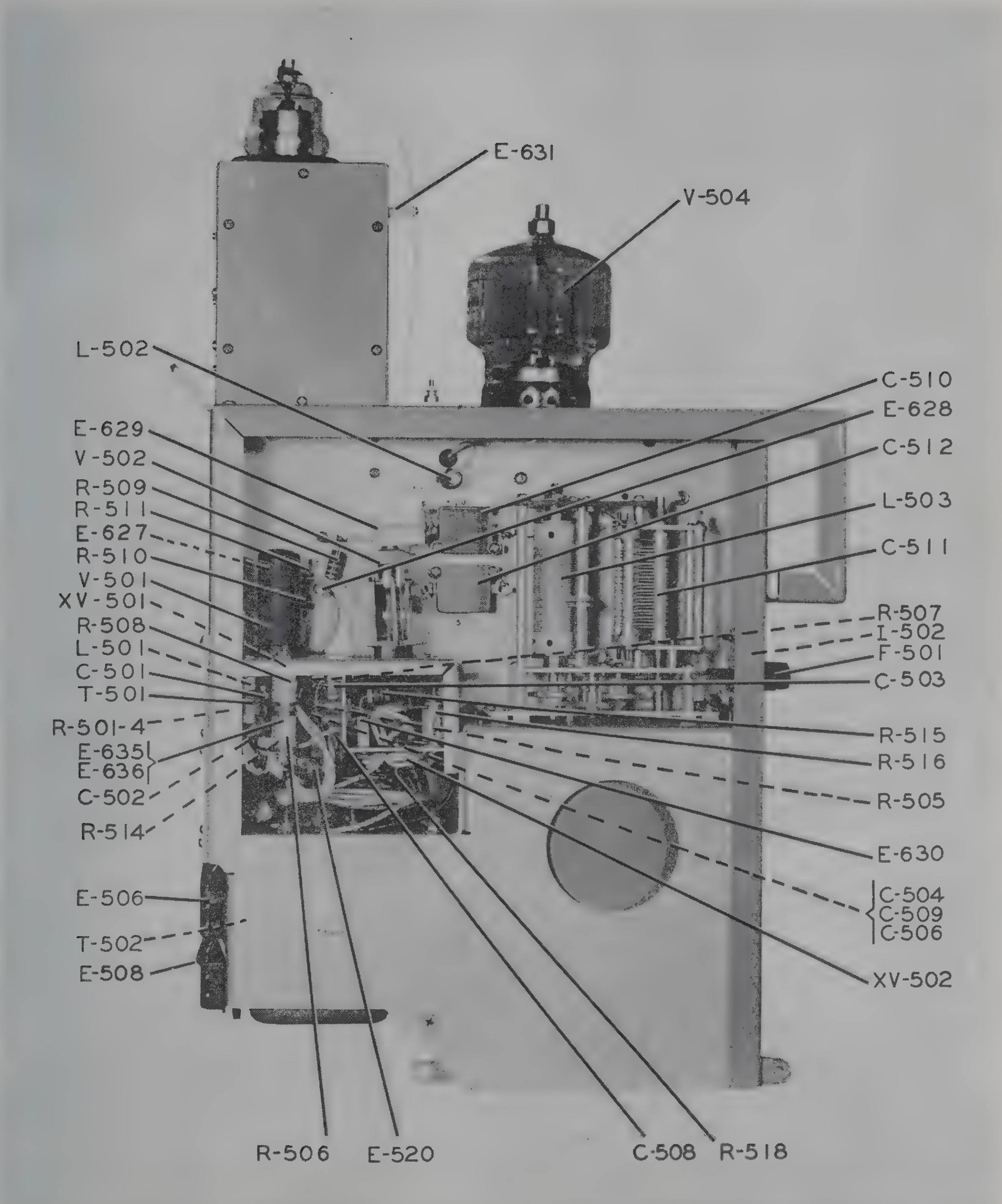


Figure 179. Radio Transmitter T-454/FRT-26, Buffer, Multiplier, and Driver Unit, Left-Side View.

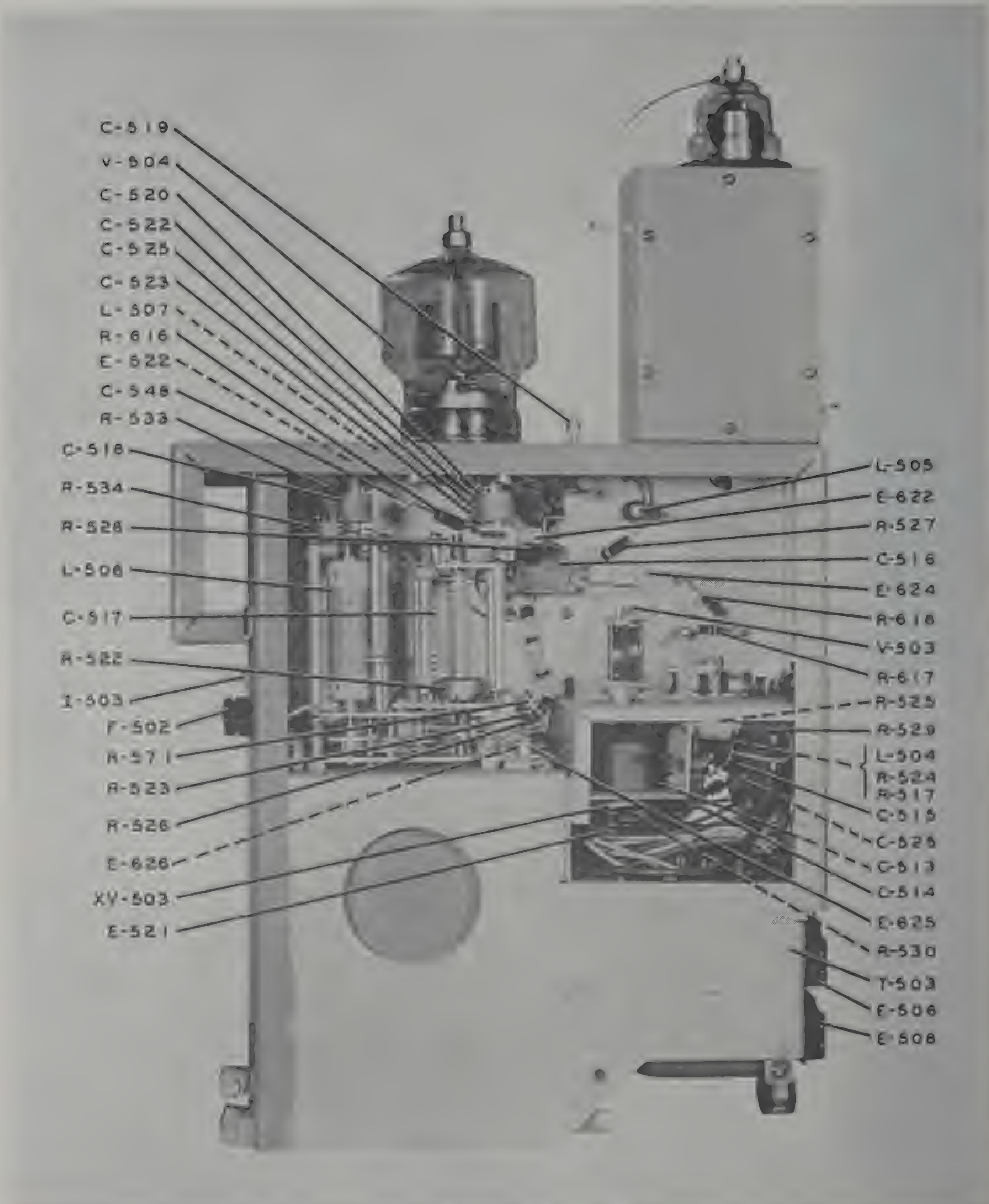


Figure 180. Radio Transmitter T-454/FRT-26, Buffer, Multiplier, and Driver Unit, Right-Side View.

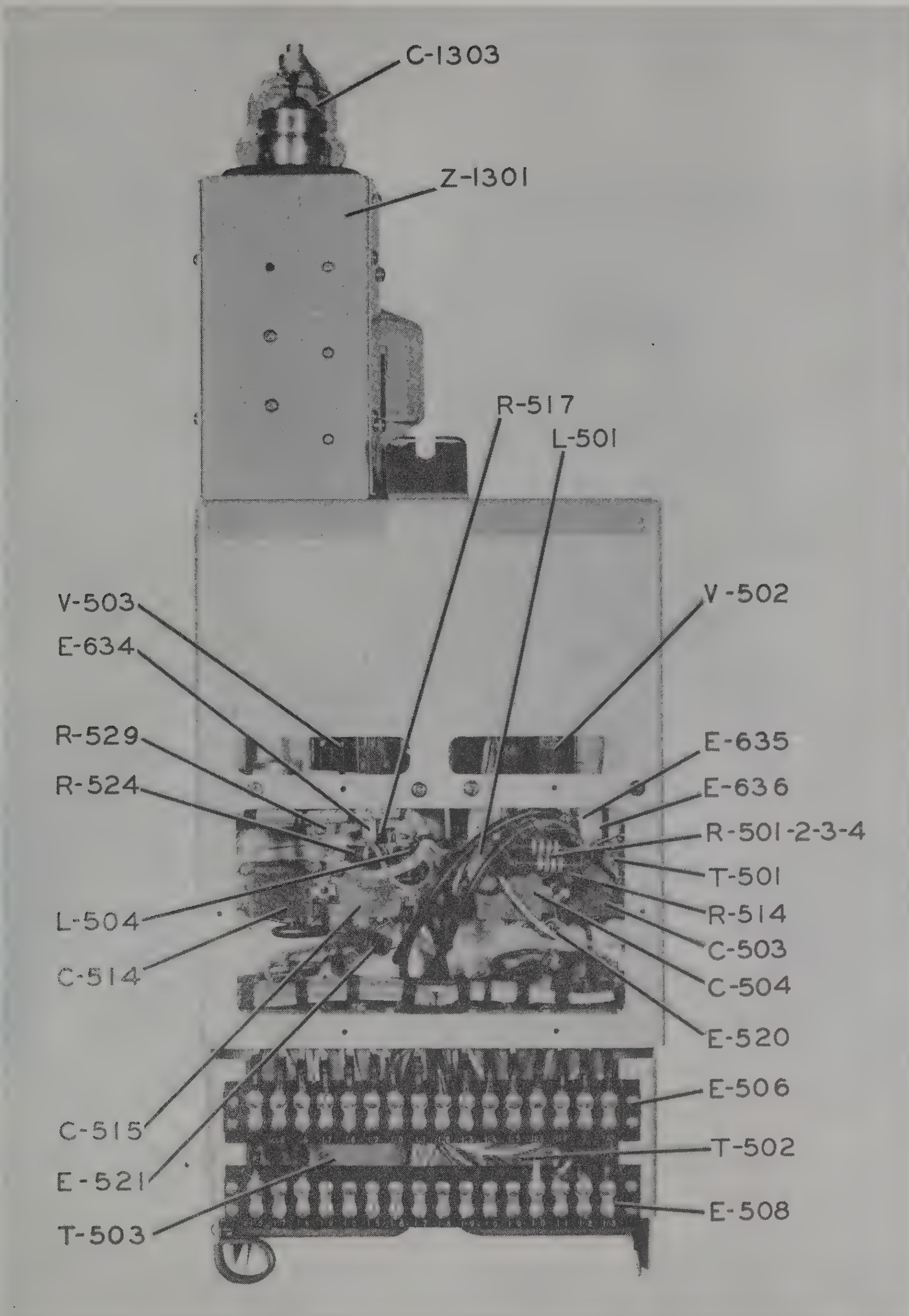


Figure 181. Radio Transmitter T-454/FRT-26, Buffer, Multiplier, and Driver Unit, Rear View.

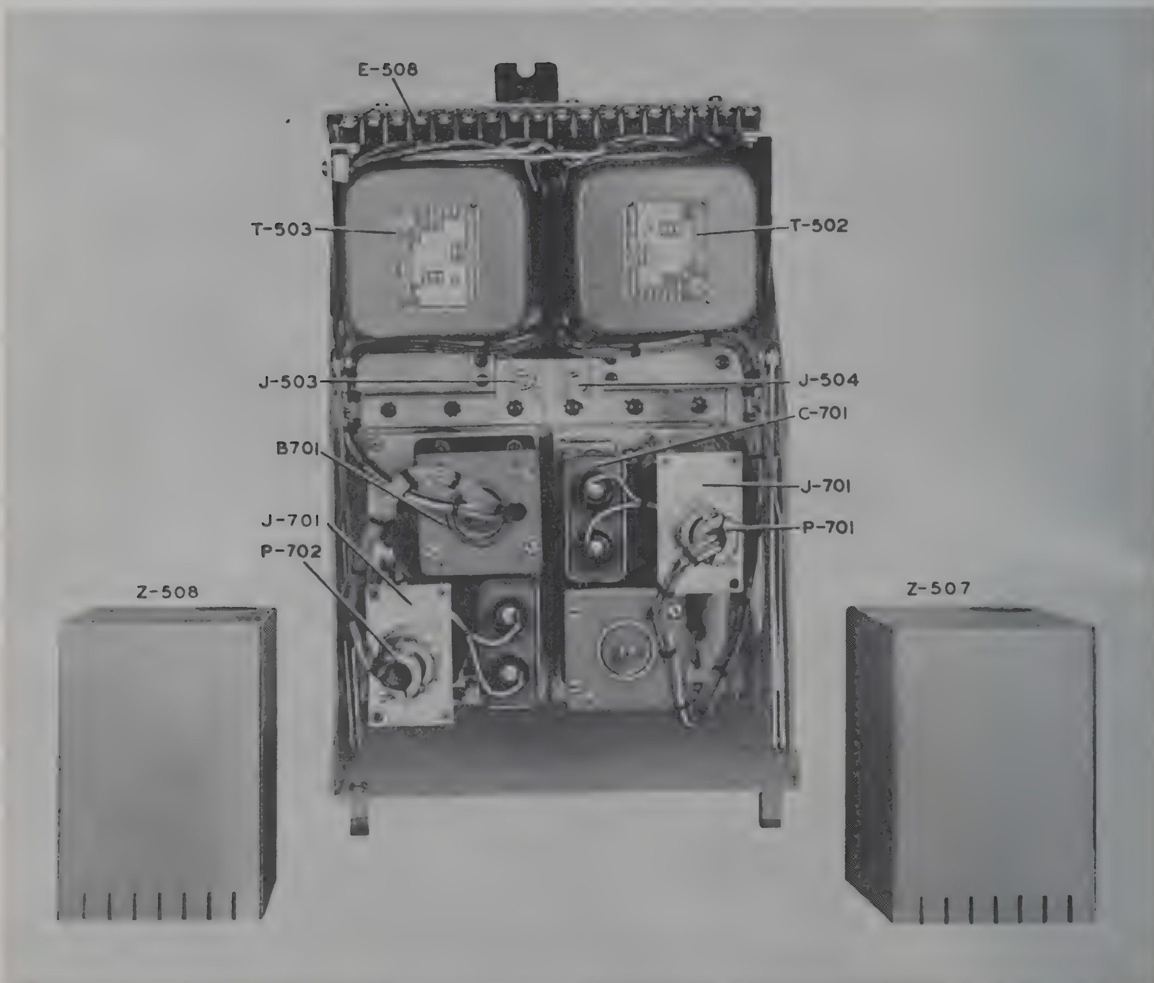


Figure 182. Radio Transmitter T-454/FRT-26, Buffer, Multiplier, and Driver Unit, Bottom View.

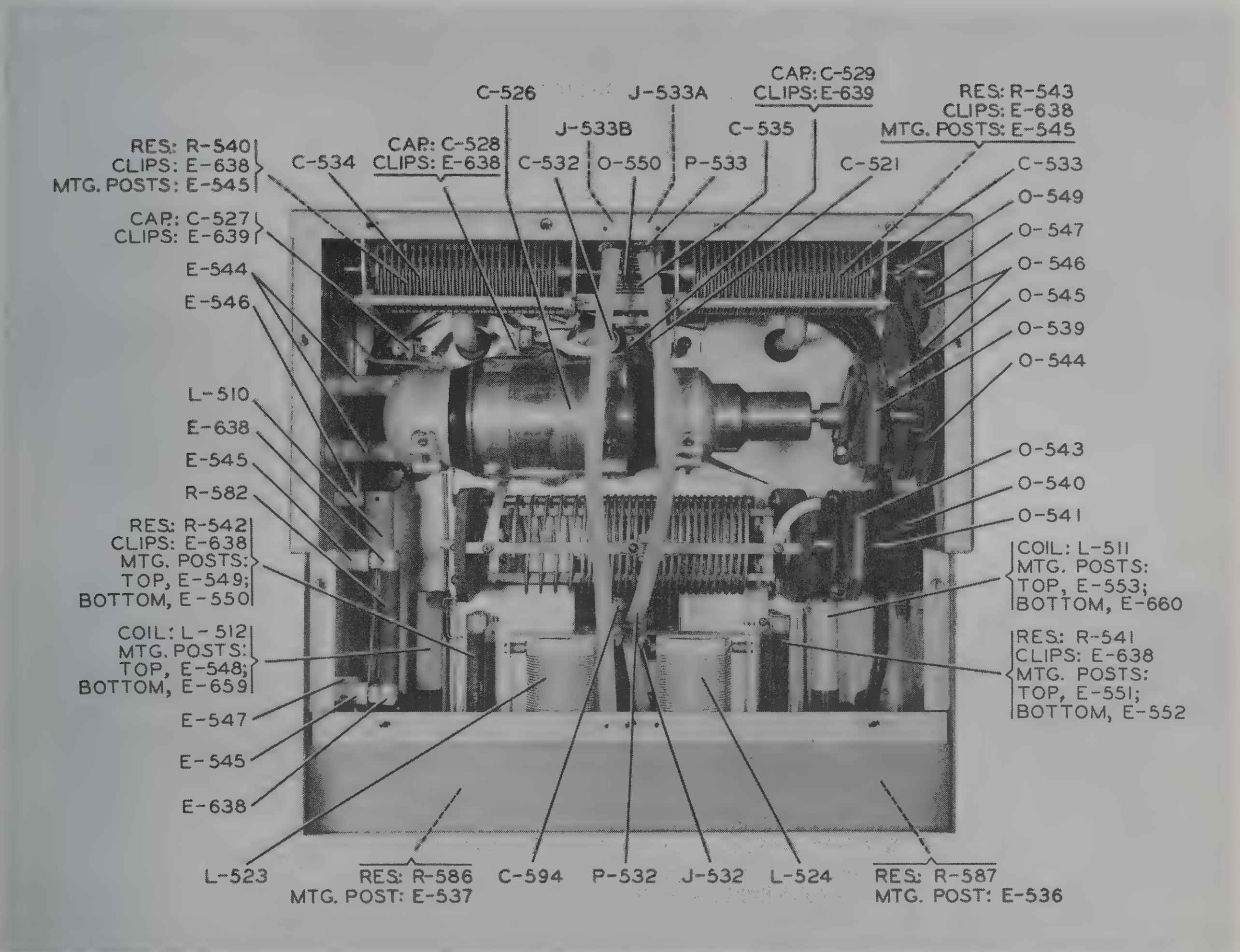


Figure 183. Radio Transmitter T-454/FRT-26, Grid Box, Panel Open, Cover Removed.

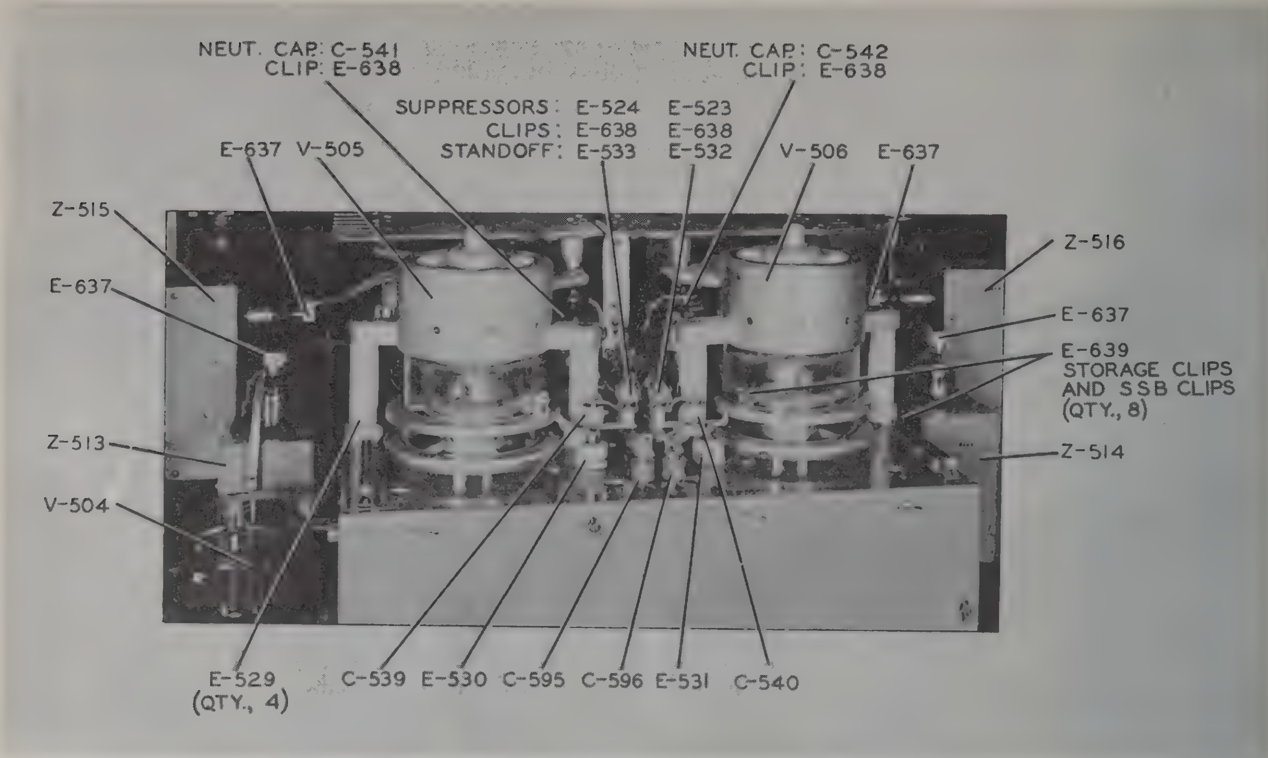


Figure 184. Radio Transmitter T-454/FRT-26, Intermediate Power Amplifier Stage, Front View.

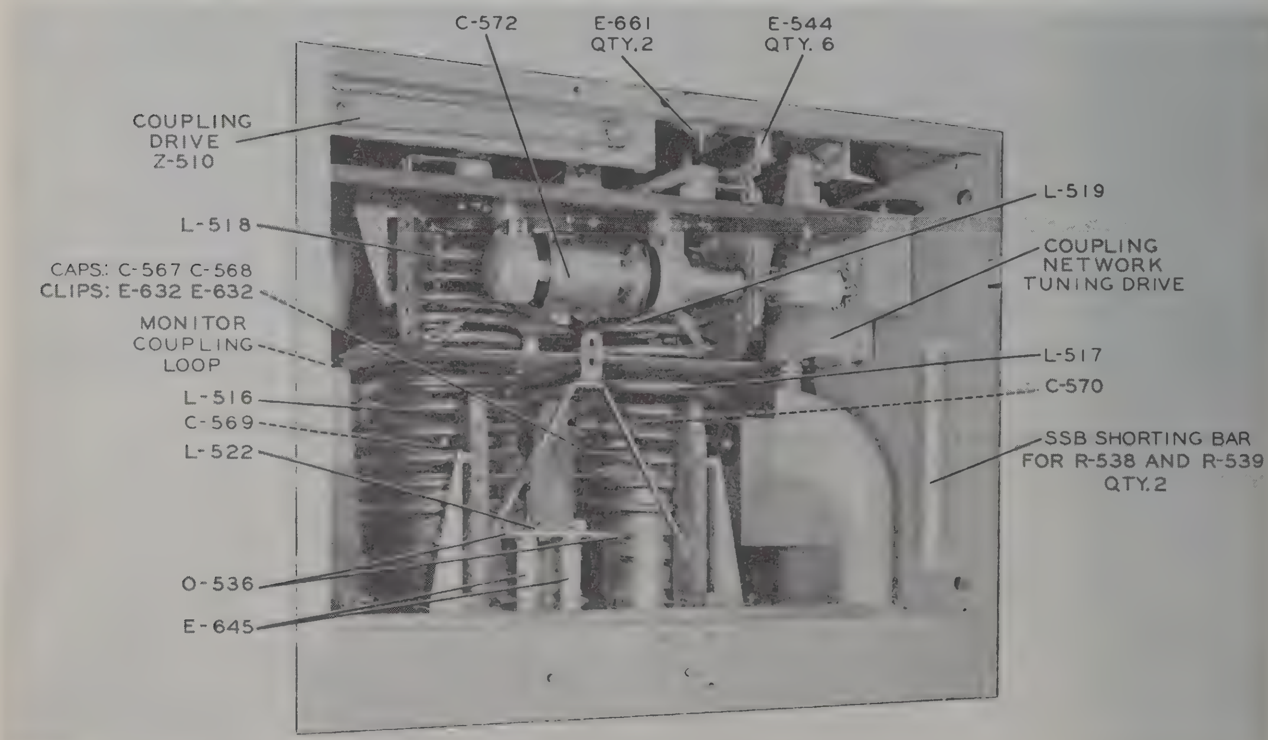


Figure 185. Radio Transmitter T-454/FRT-26, Intermediate Power Amplifier Stage, Rear View.

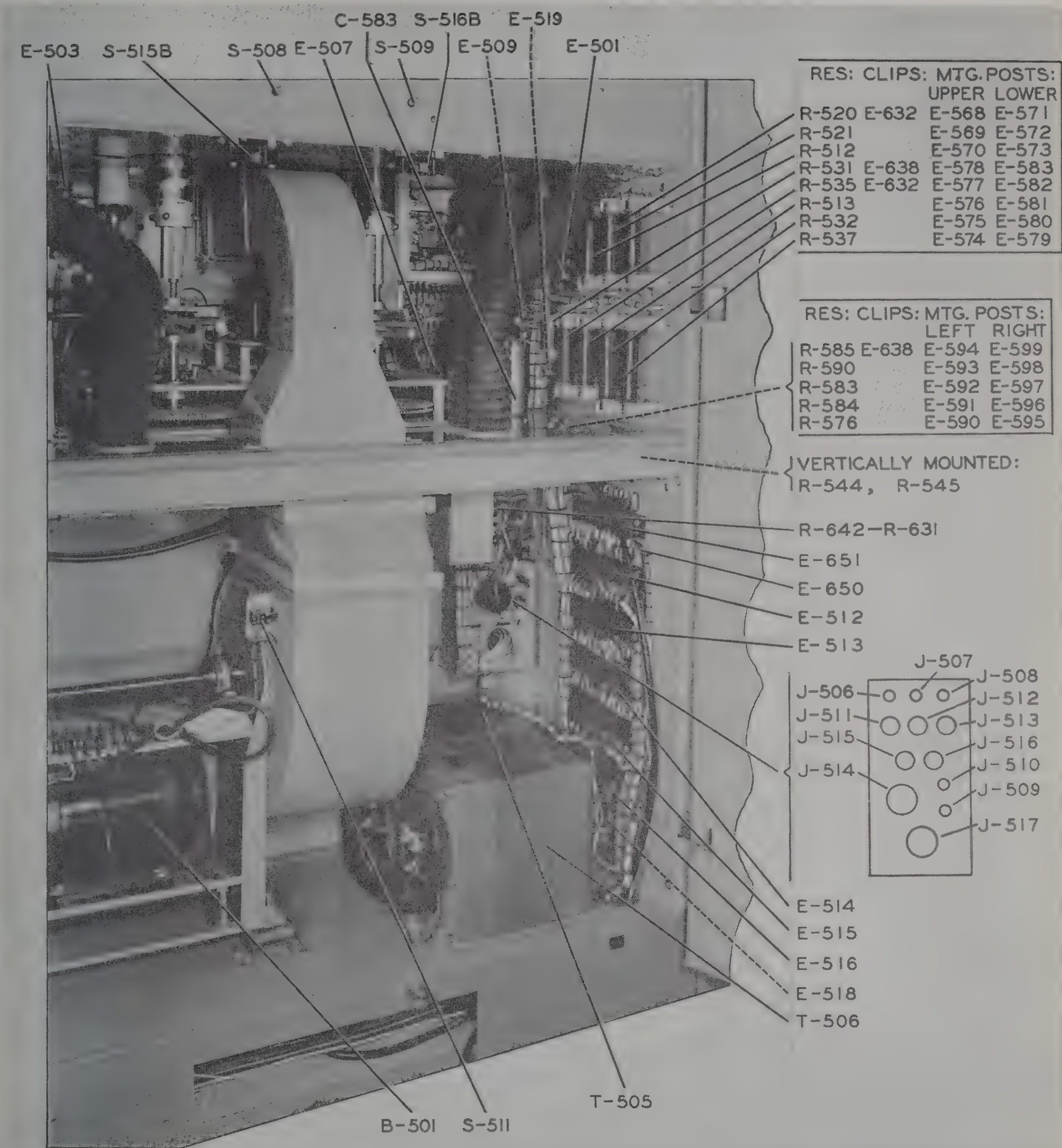


Figure 186. Radio Transmitter T-454/FRT-26, Left-Side Cabinet Wall, Rear View.

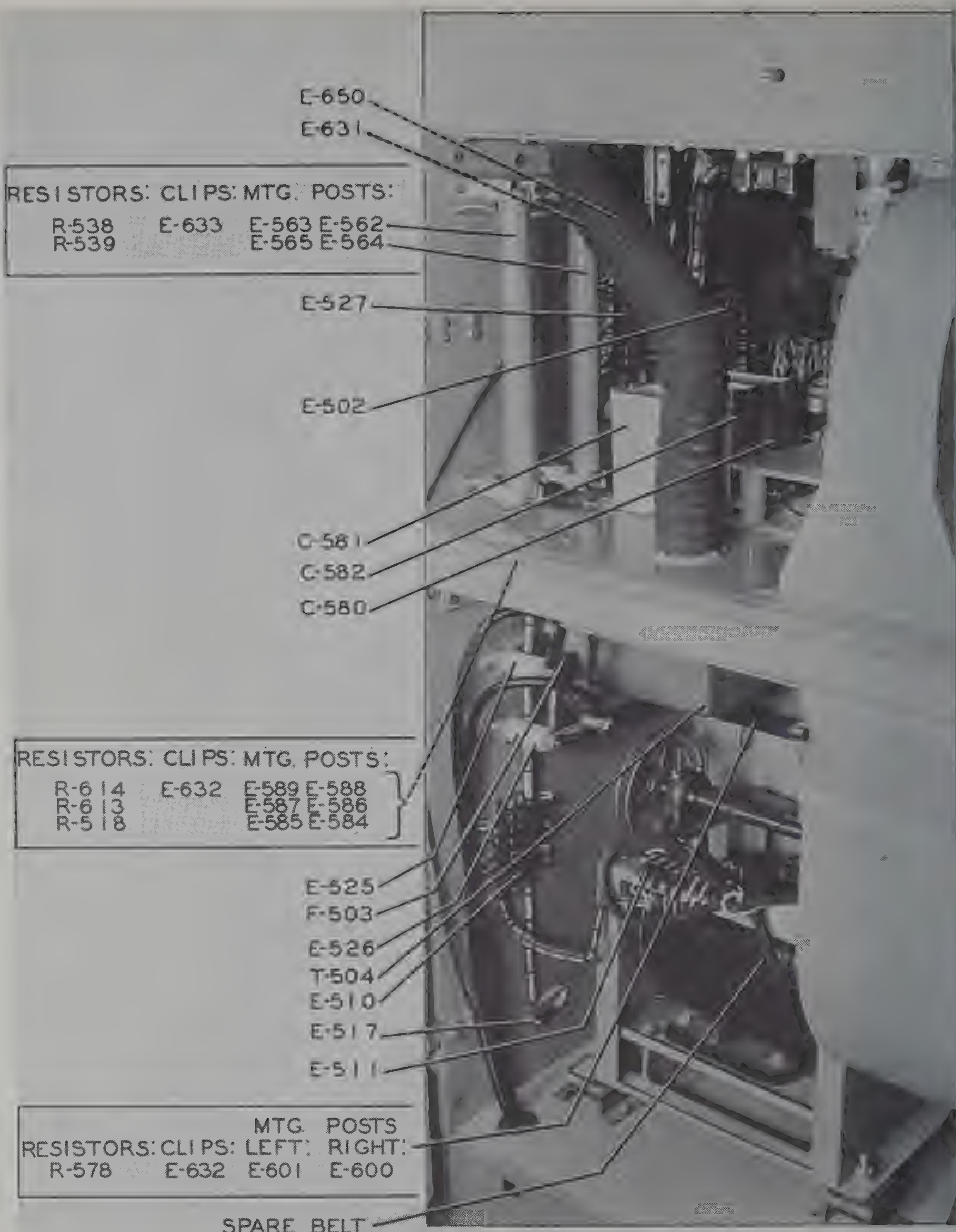


Figure 187. Radio Transmitter T-454/FRT-26, Right-Side Cabinet Wall, Rear View.

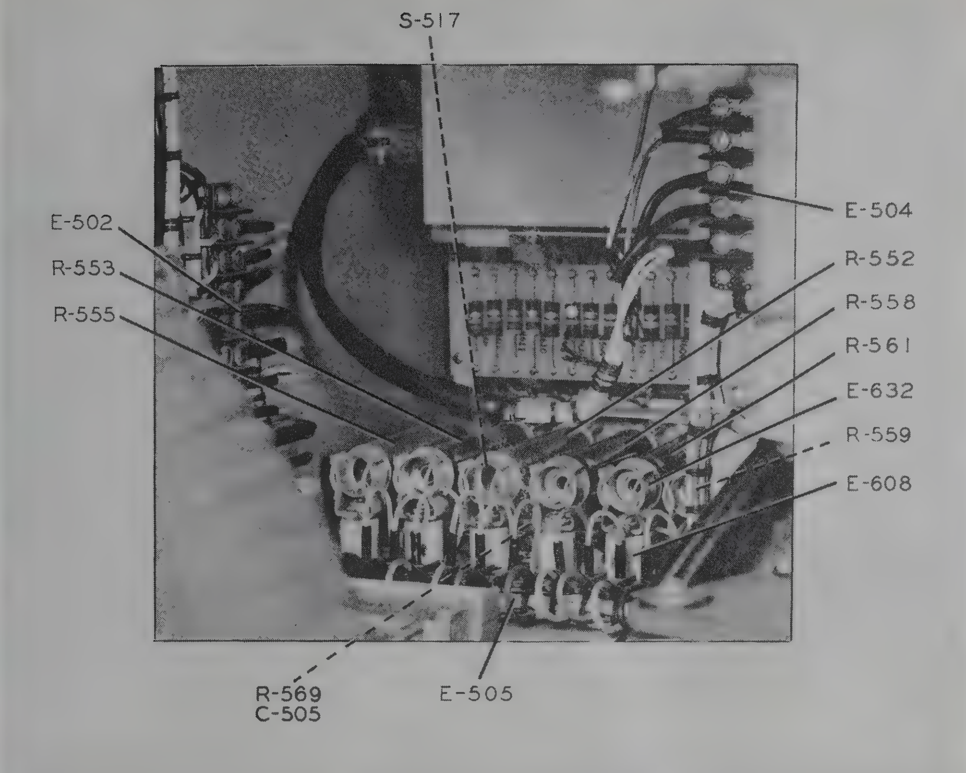


Figure 188. Radio Transmitter T-454/FRT-26, Components Behind Electronic Keyer, Detail Rear View.

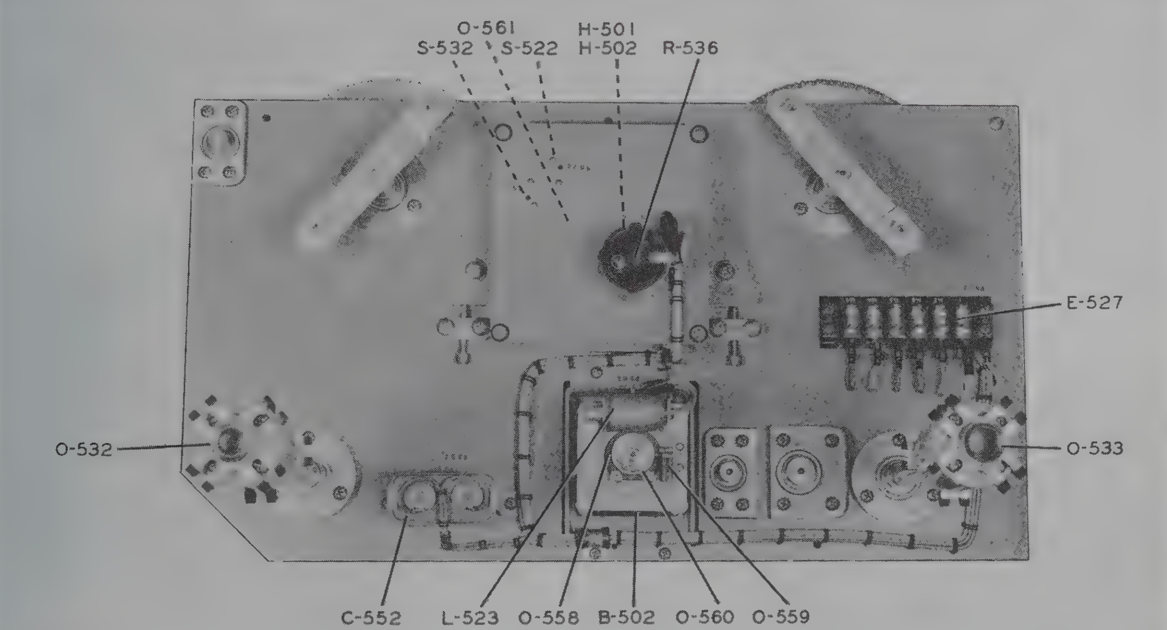


Figure 189. Radio Transmitter T-454/FRT-26, IPA Plate Tank Drive Assembly, Top View.

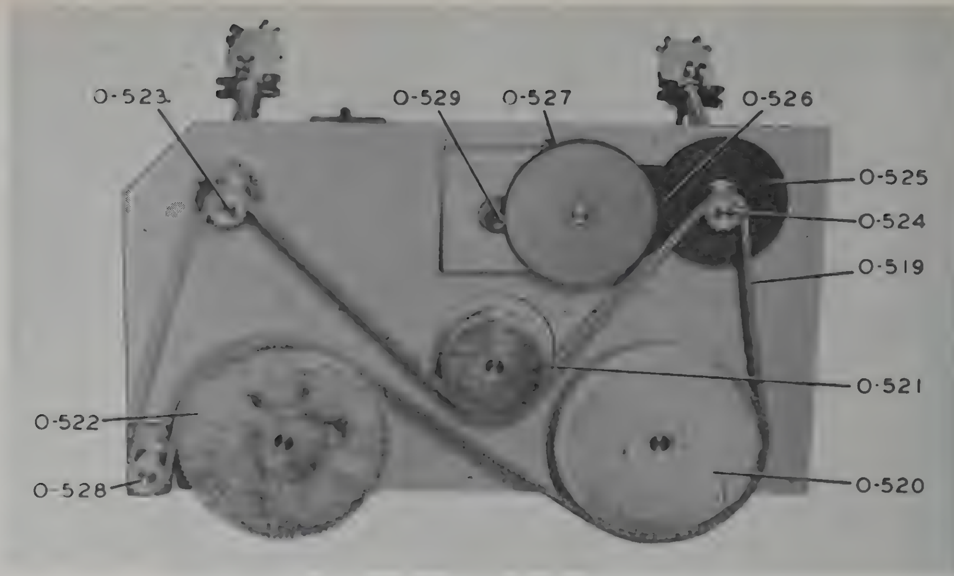


Figure 190. Radio Transmitter T-454/FRT-26, IPA Plate Tank Drive Assembly, Bottom View.

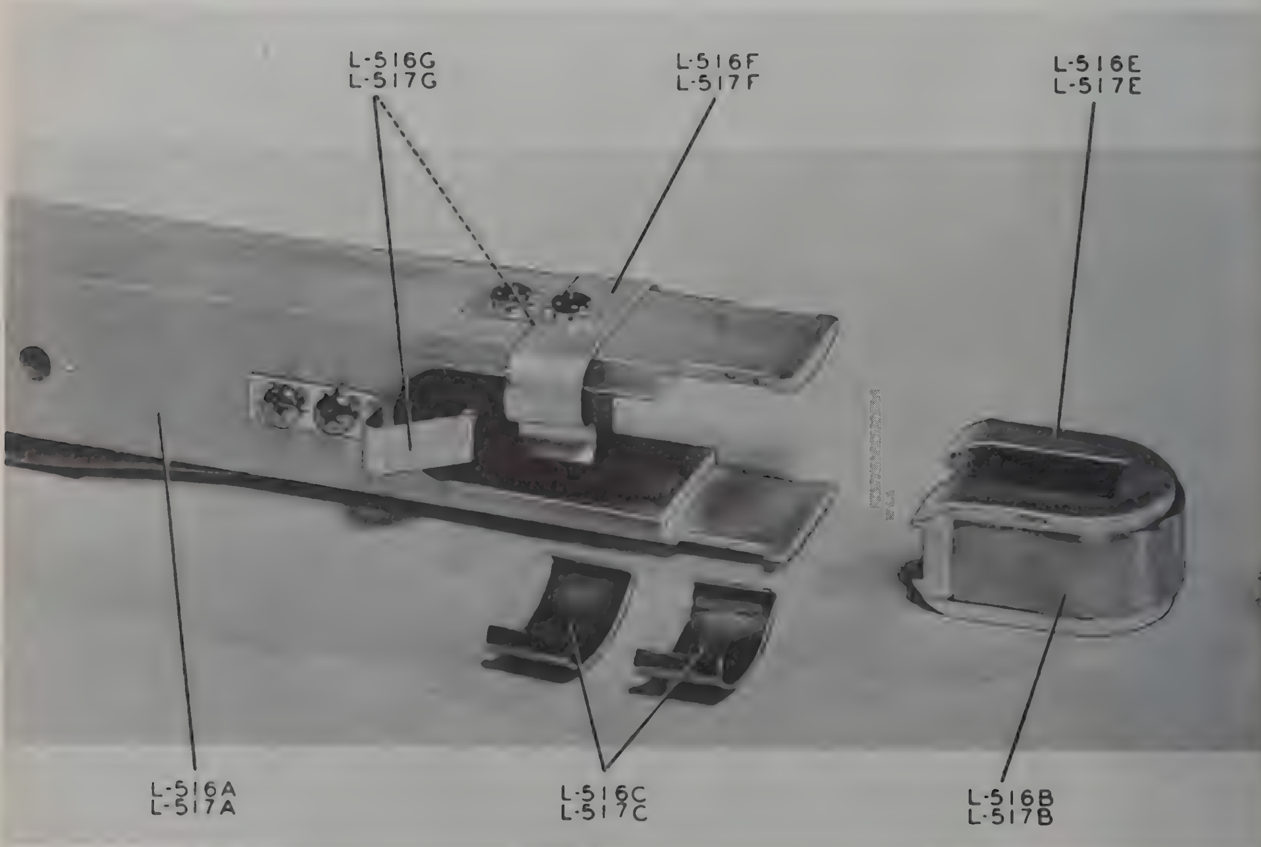


Figure 191. Radio Transmitter T-454/FRT-26, IPA Plate Tank Sliding Contact Assembly.

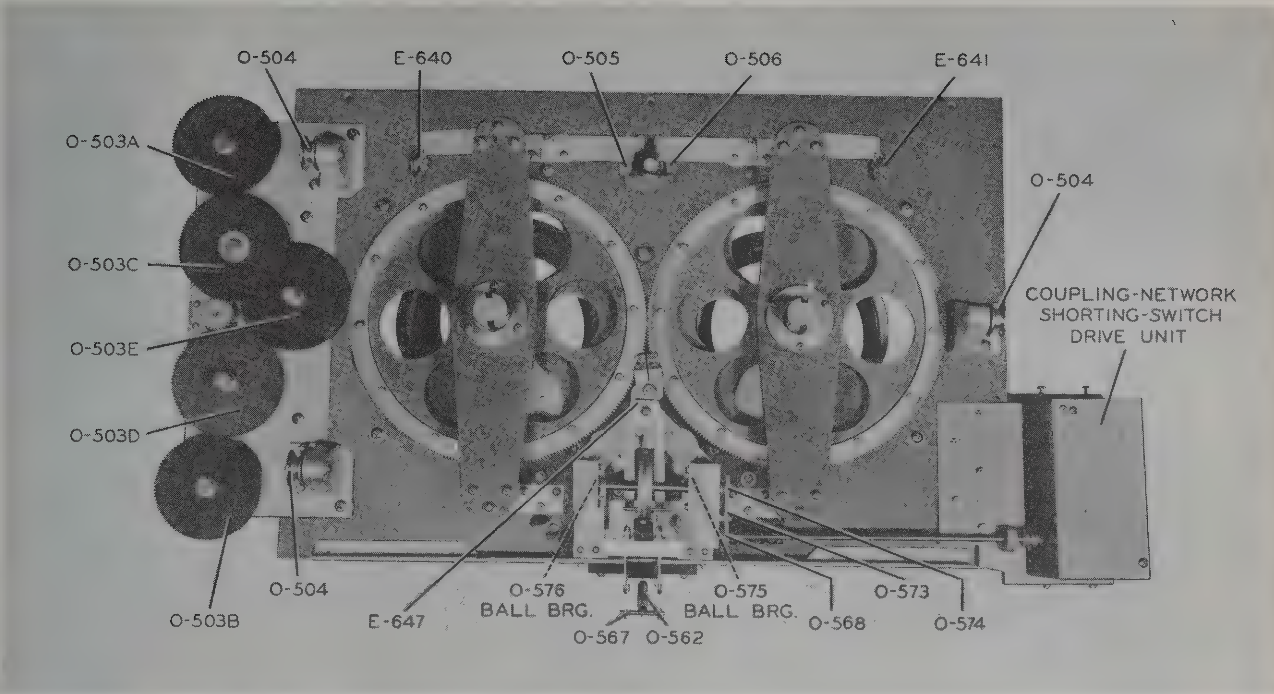


Figure 192. Radio Transmitter T-454/FRT-26, IPA Coupling Network, Top View.

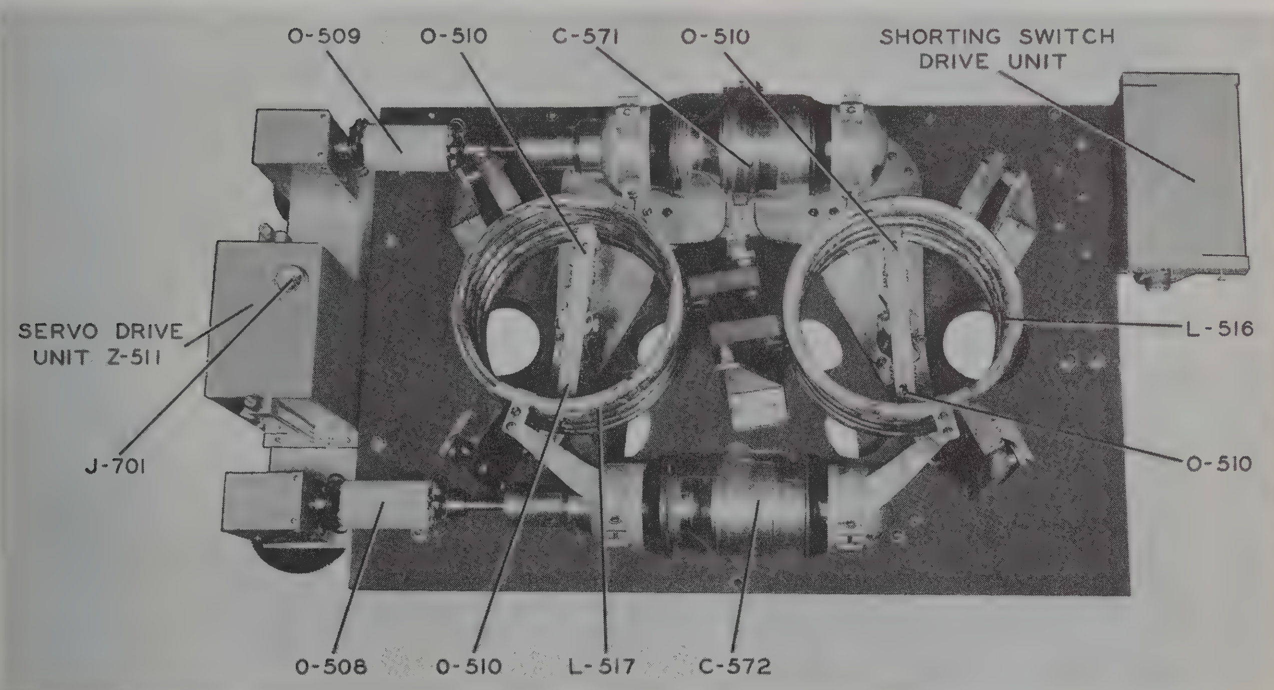


Figure 193. Radio Transmitter T-454/FRT-26, IPA Coupling Network, Bottom View.

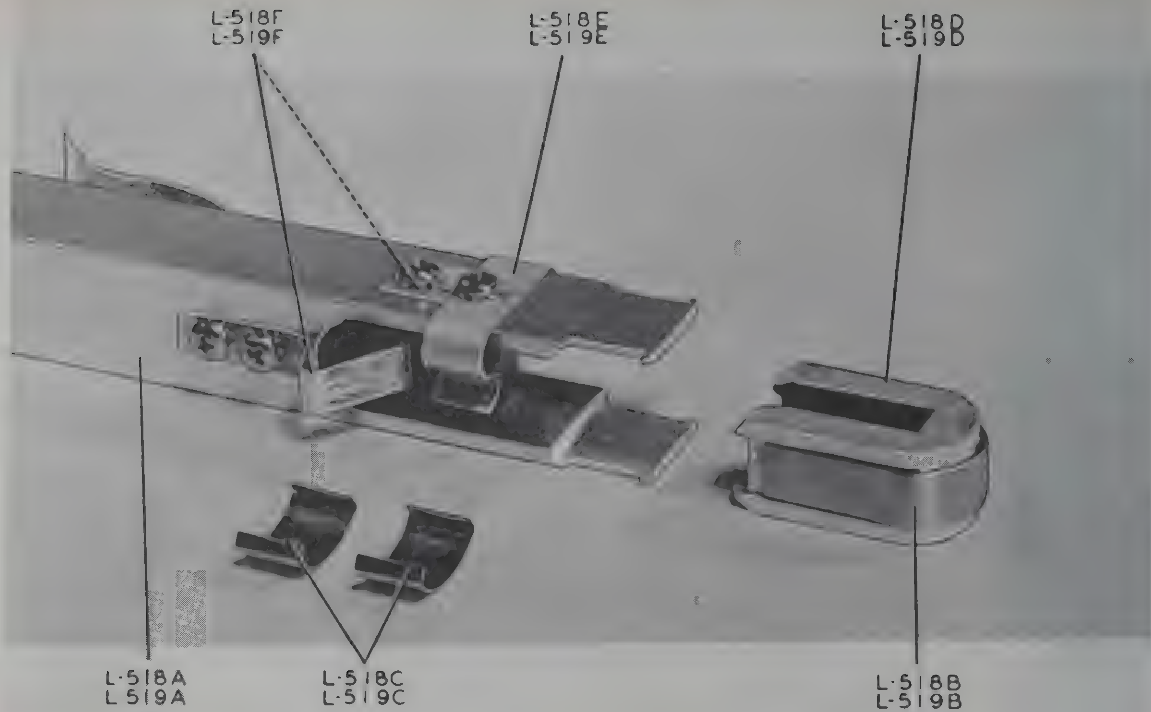


Figure 194. Radio Transmitter T-454/FRT-26, IPA Coupling Network, Sliding Contact Assembly.

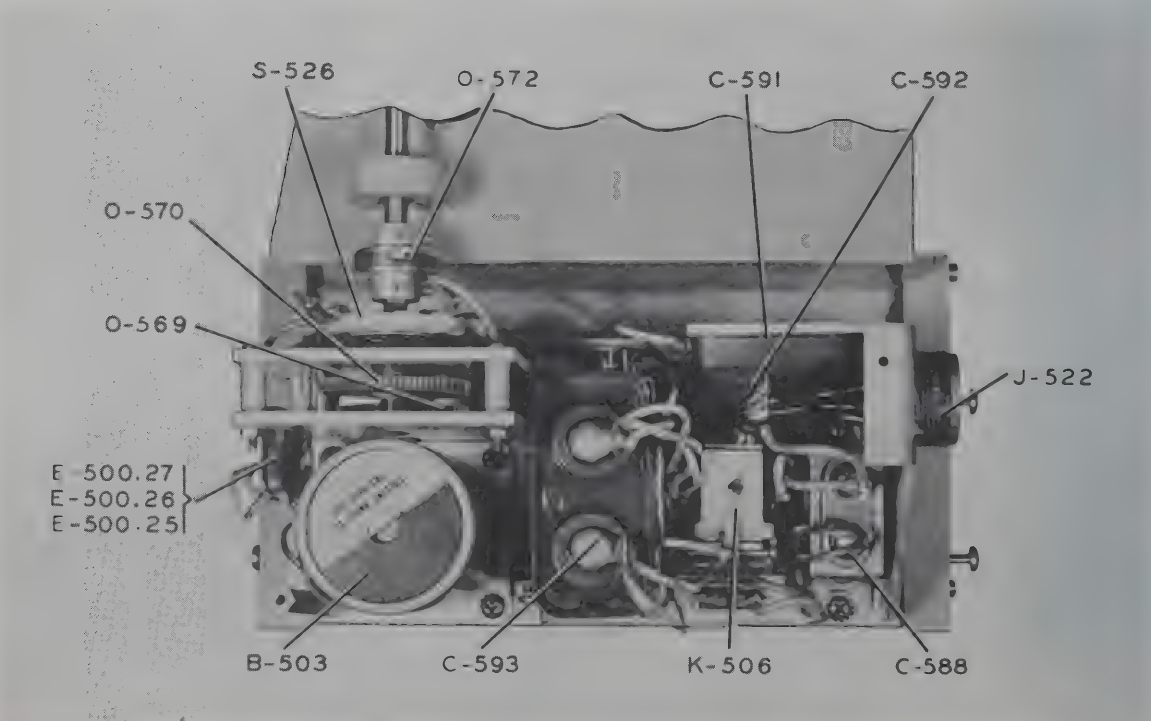


Figure 195. Radio Transmitter T-454/FRT-26, IPA Coupling Network, Shorting Switch Drive Unit.

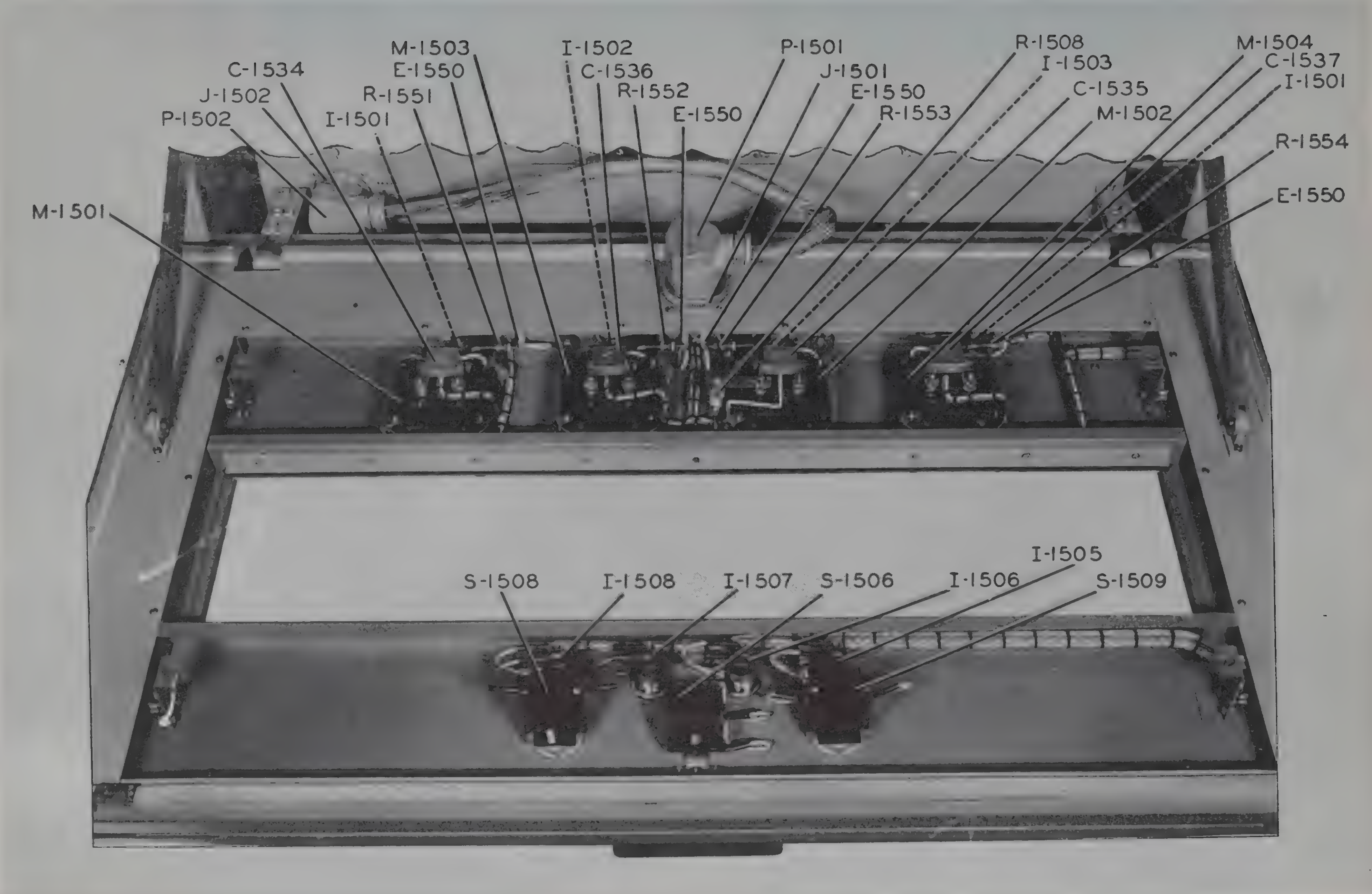


Figure 196. R-F Amplifier AM-738/FRT-22, Upper Front Panel, Rear View.

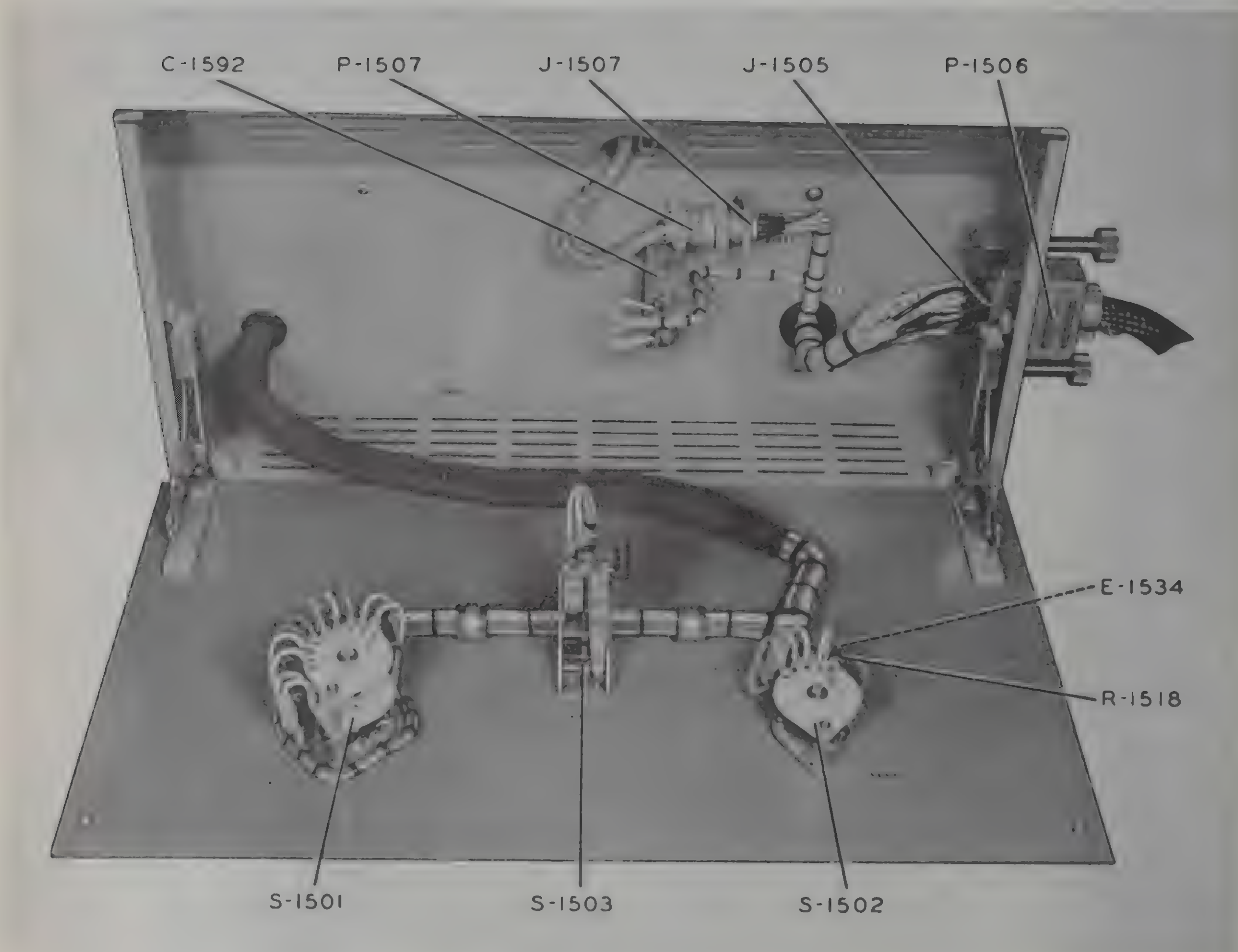


Figure 197. R-F Amplifier AM-738/FRT-22, Lower Control Panel, Rear View.

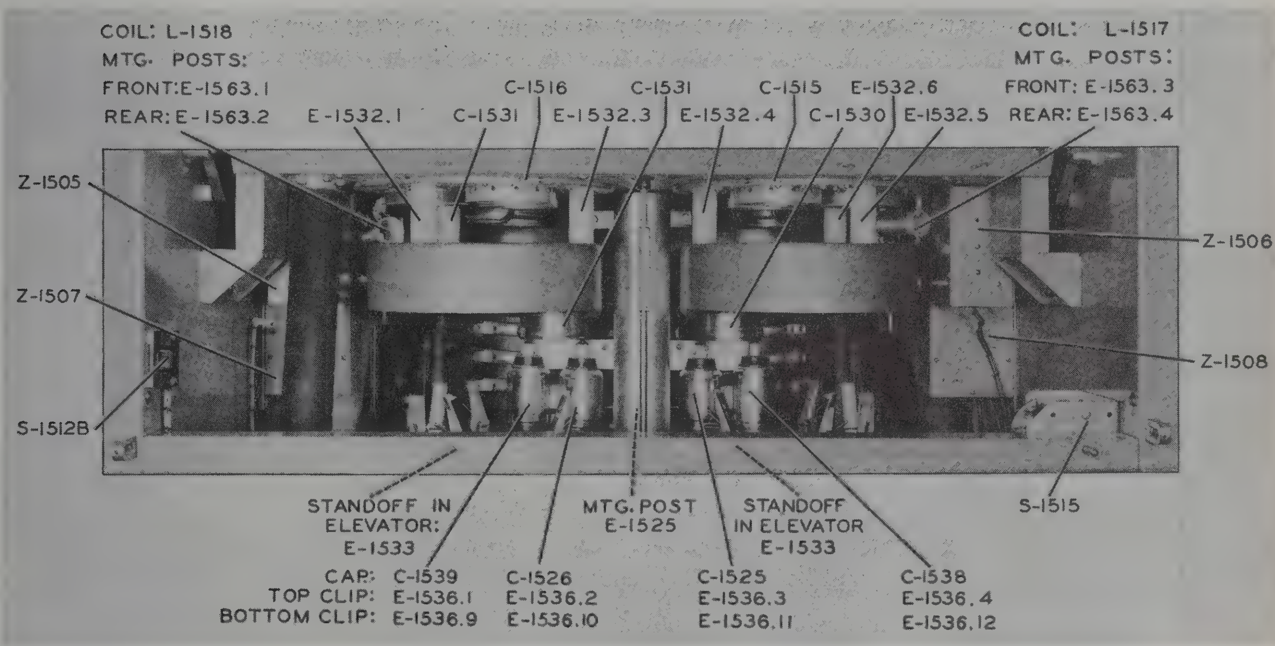


Figure 198. R-F Amplifier AM-738/FRT-22, Power Amplifier Stage, Tubes Removed, Front View.

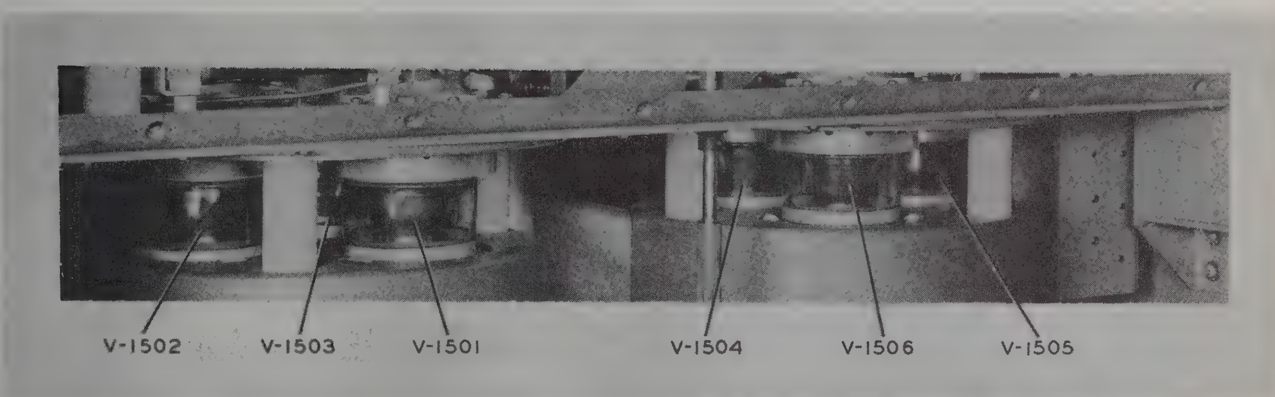


Figure 199. R-F Amplifier AM-738/FRT-22, Power Amplifier Tubes, Front View.

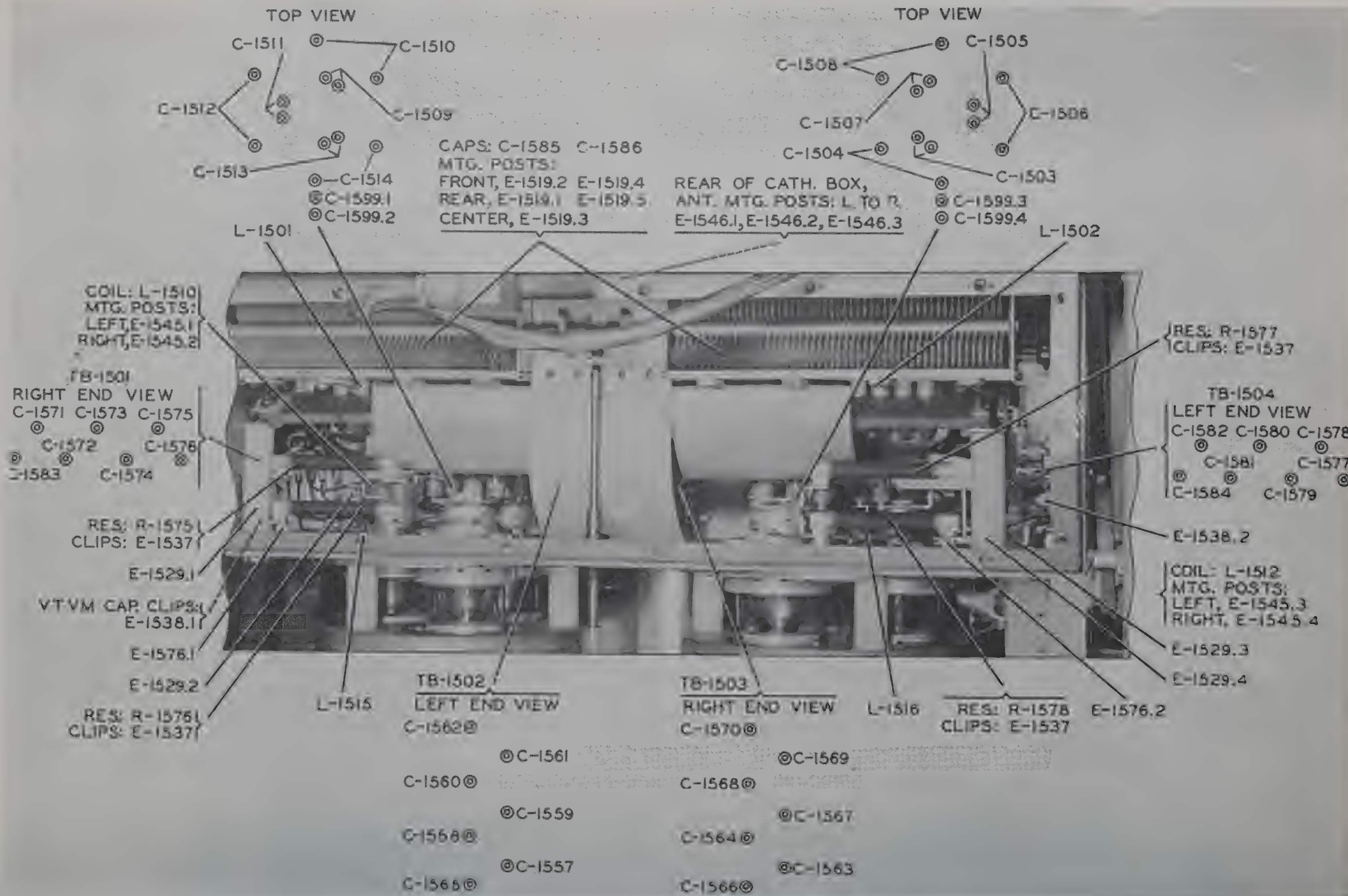


Figure 200. R-F Amplifier AM-738/FRT-22, Cathode Compartment.

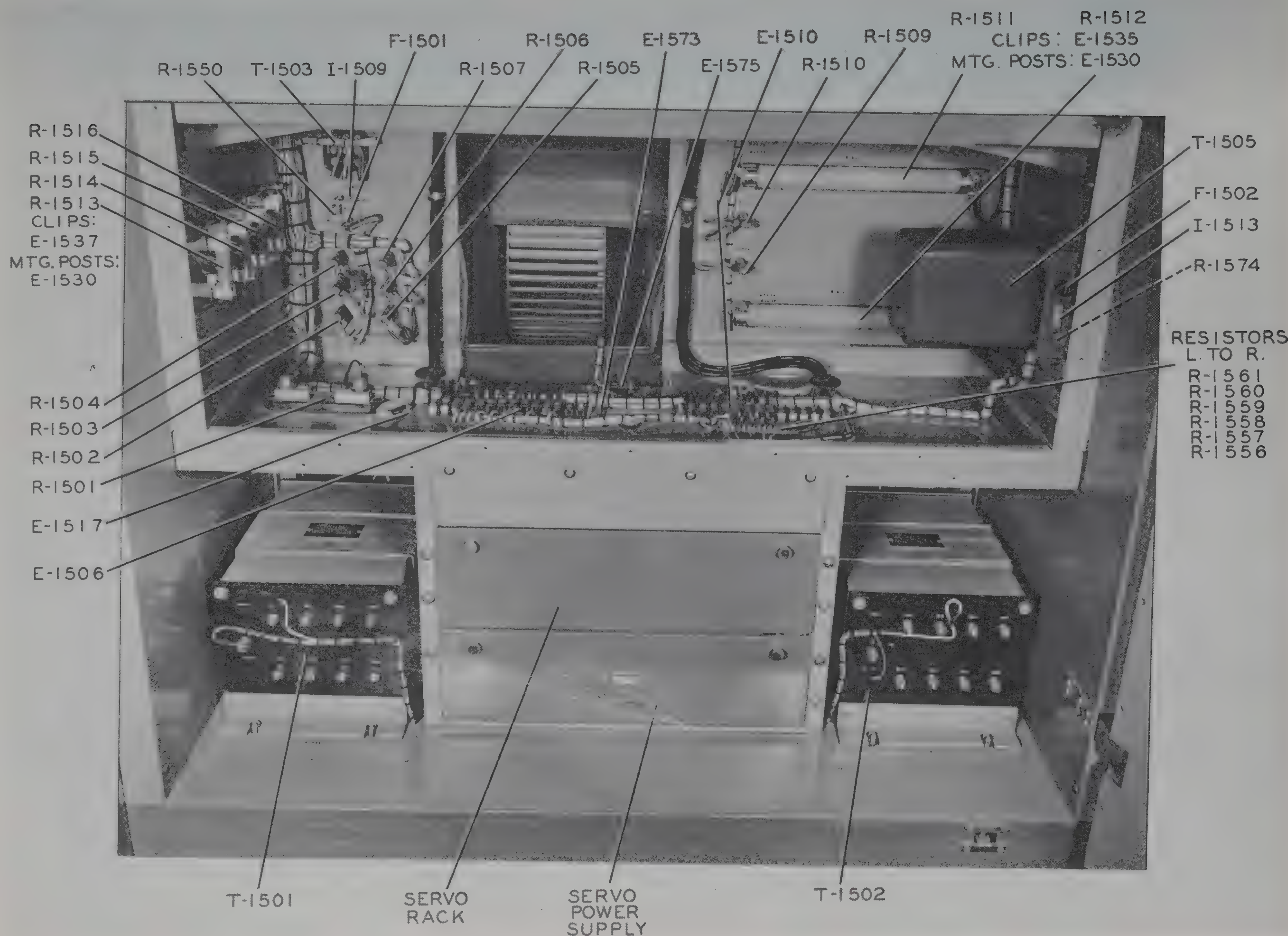


Figure 201. R-F Amplifier AM-738/FRT-22, Plenum Chamber and PA Filament Transformers, Covers Removed, Front View.

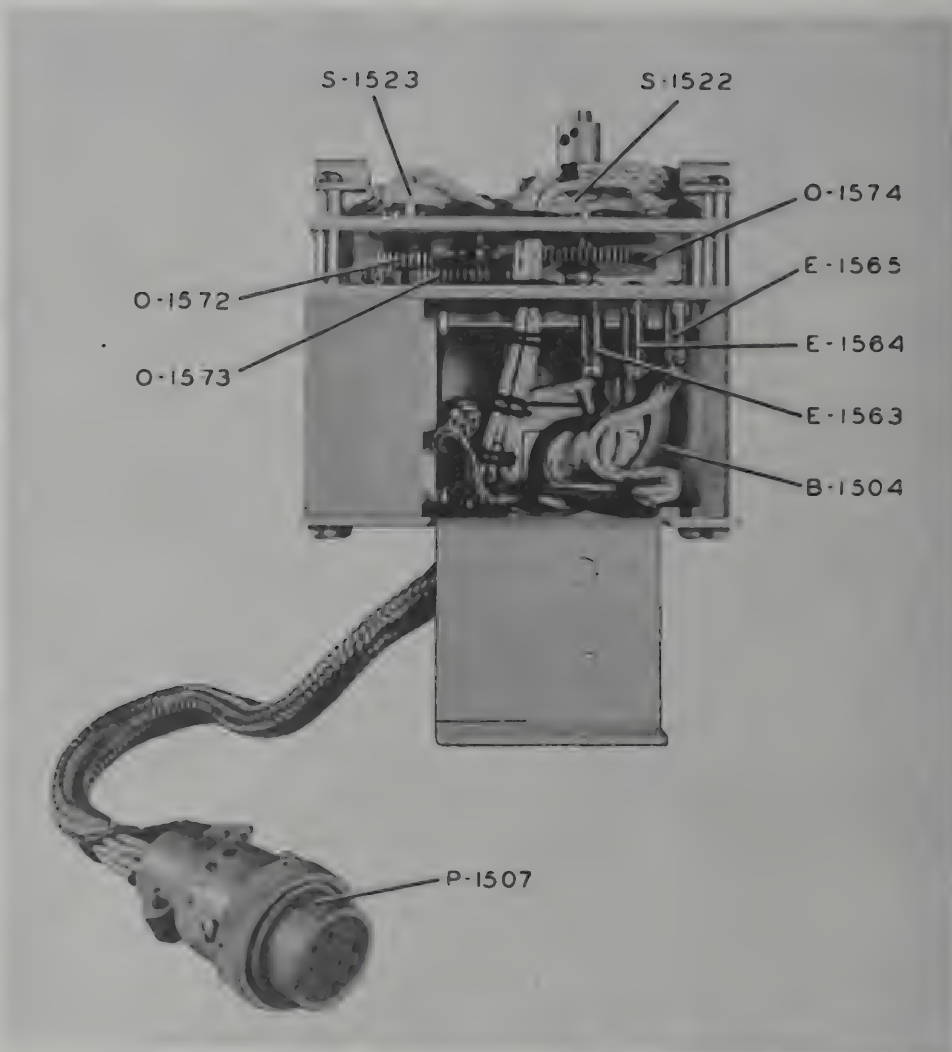


Figure 202. R-F Amplifier AM-738/FRT-22. PA Input Capacity Drive Unit.

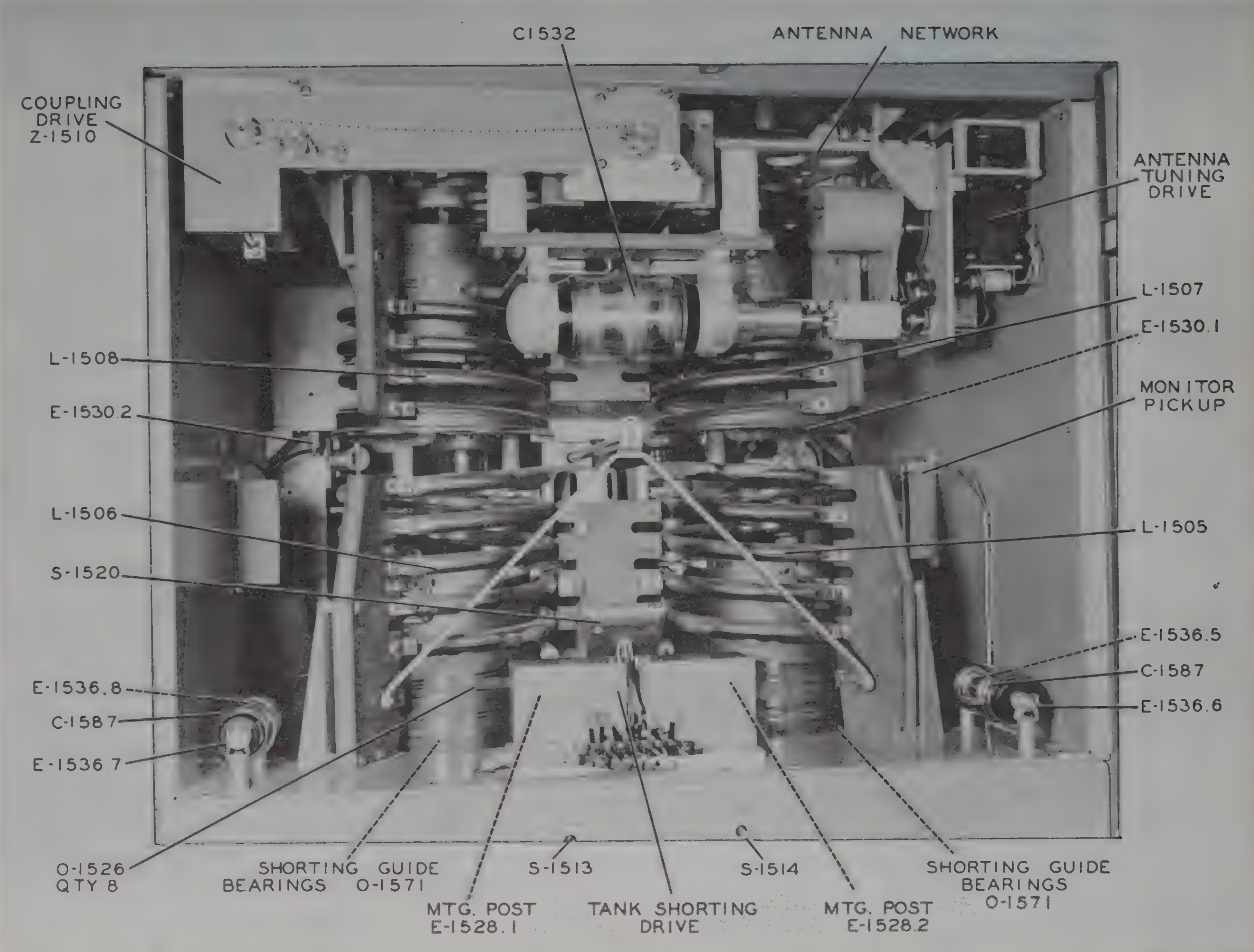


Figure 203. R-F Amplifier AM-738/FRT-22, Power Amplifier Stage, Rear View.

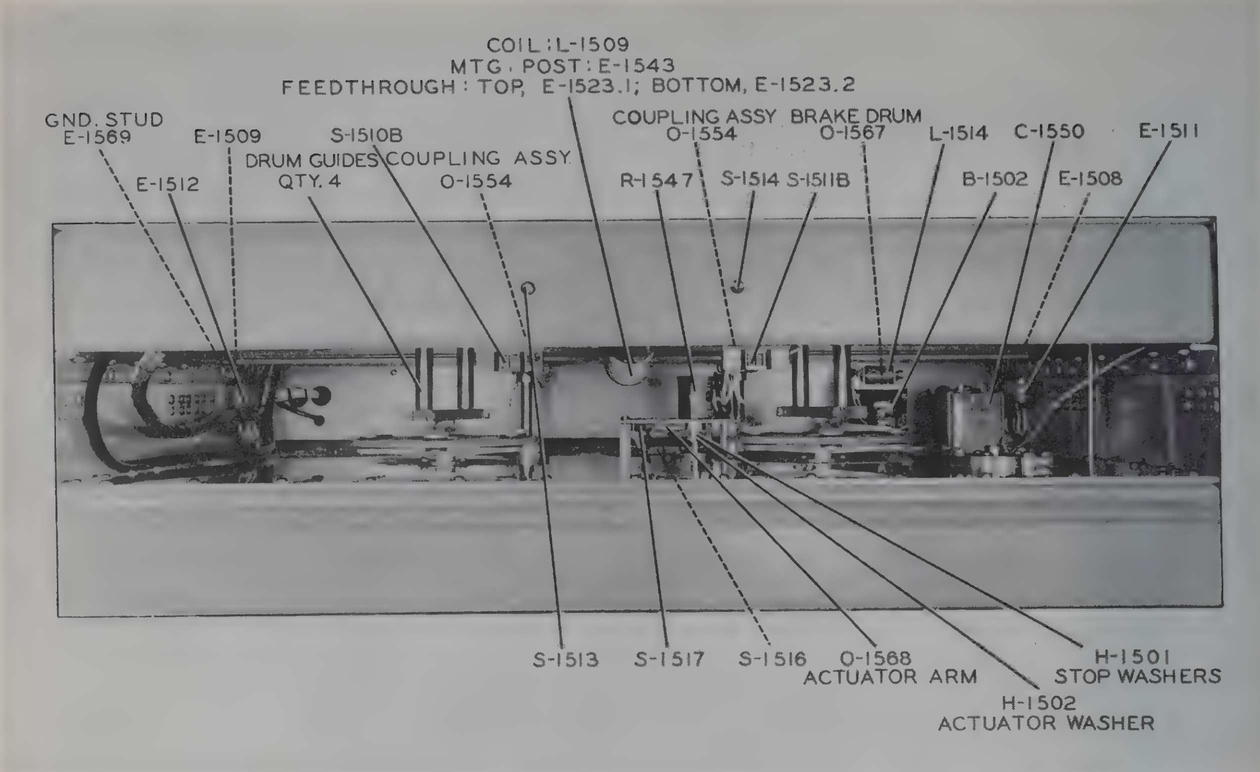


Figure 204. R-F Amplifier AM-738/FRT-22, Center Deck, Rear View.

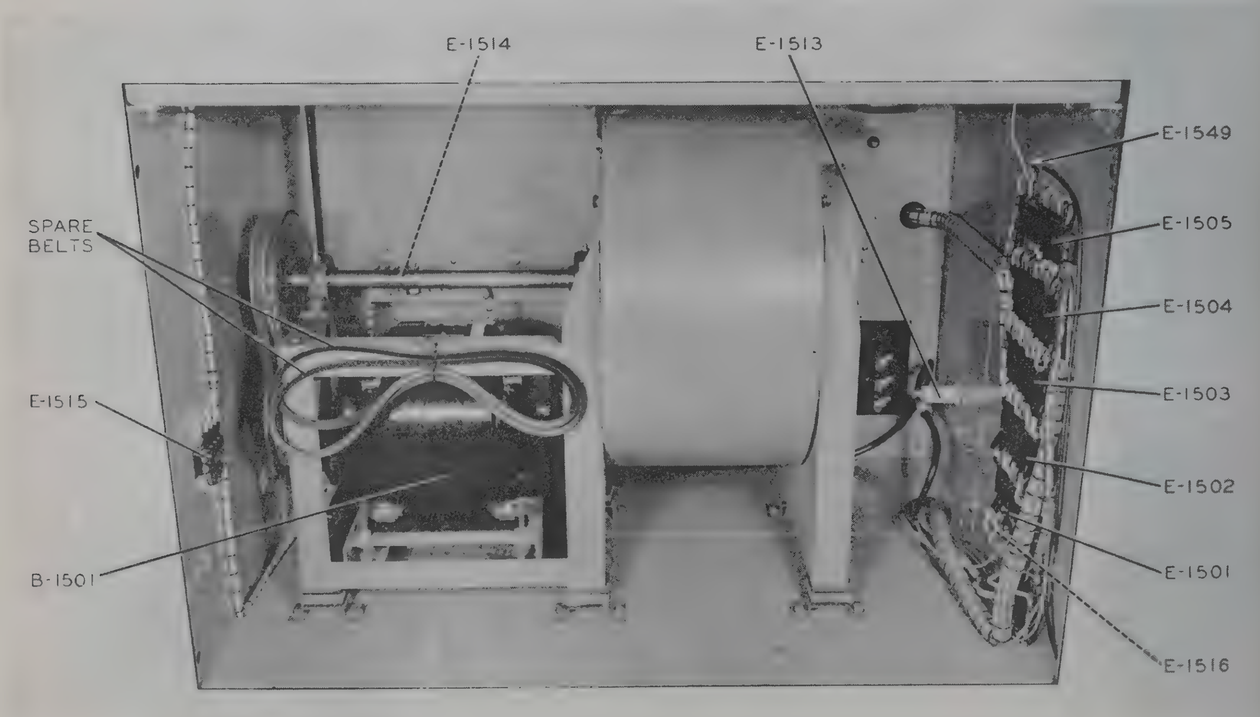


Figure 205. R-F Amplifier AM-738/FRT-22, Lower Deck, Rear View.

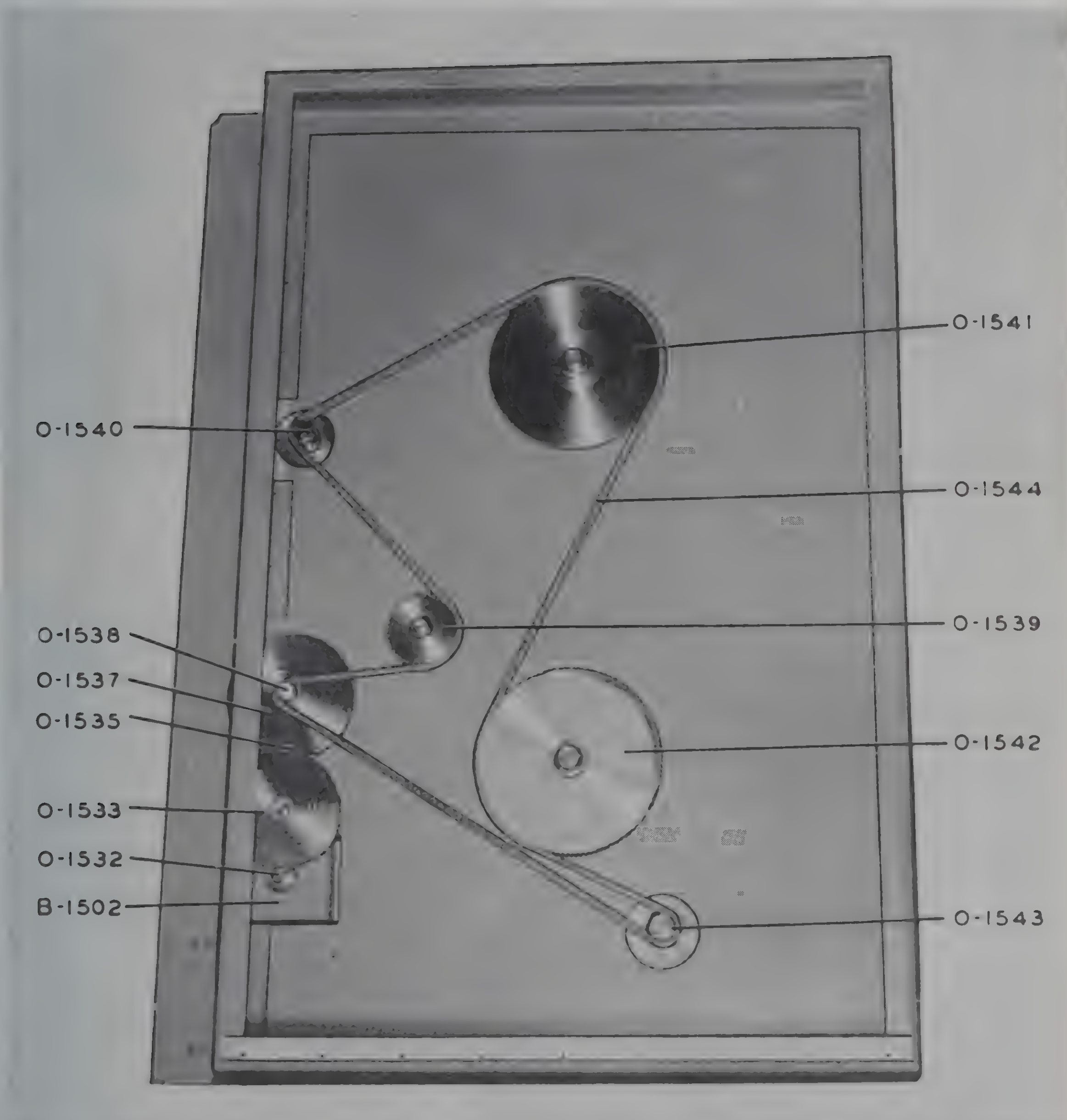


Figure 206. R-F Amplifier AM-738/FRT-22, PA Plate Tank Drive Assembly, Bottom View.

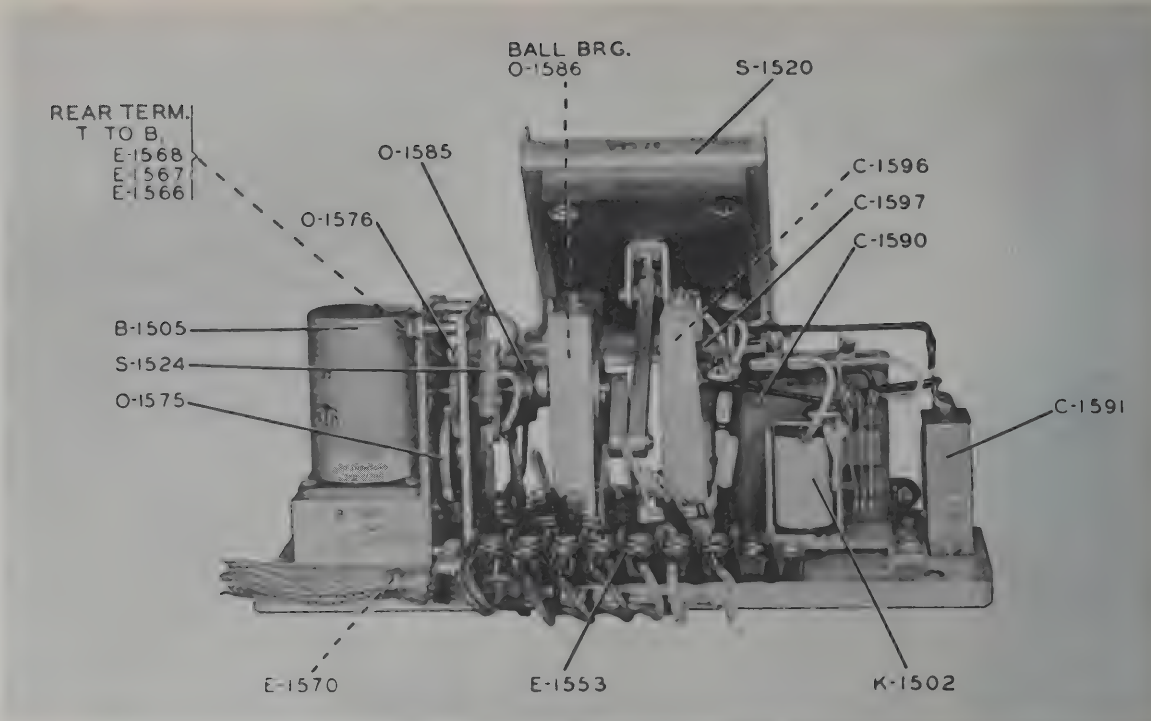


Figure 207. R-F Amplifier AM-738/FRT-22, PA Plate Tank Shorting Drive Unit.

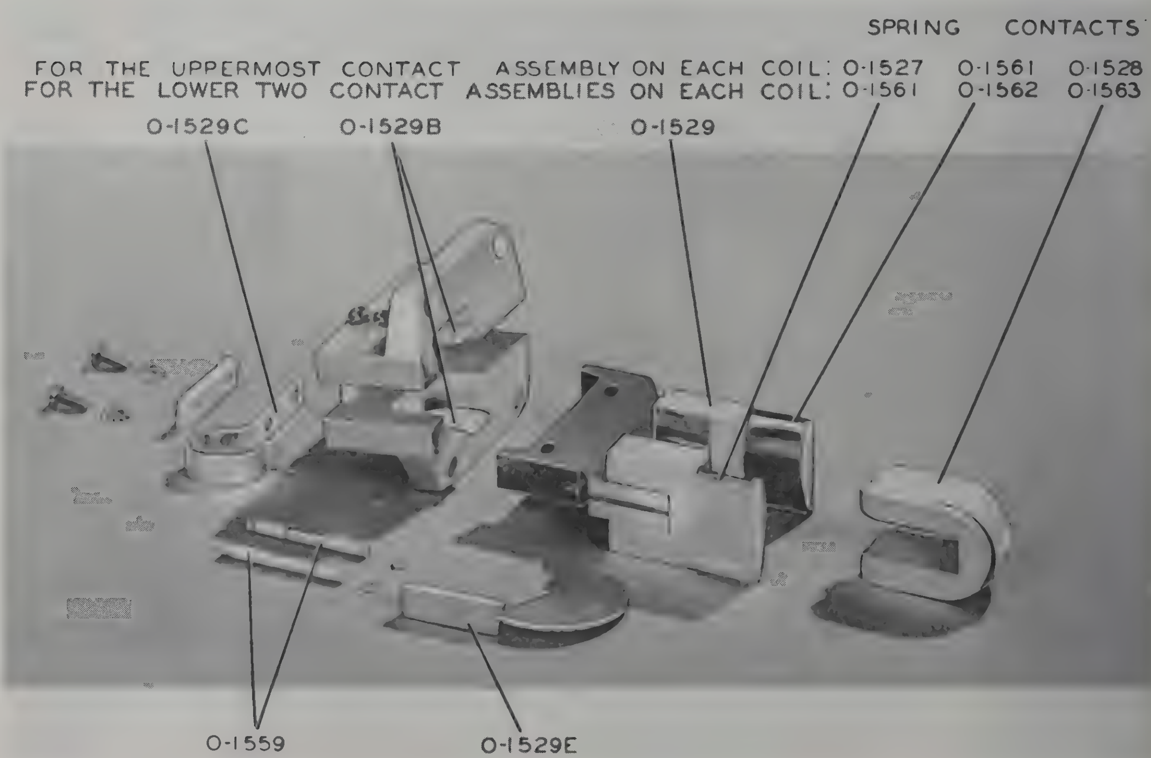


Figure 208. R-F Amplifier AM-738/FRT-22, PA Plate Tank Sliding Contact Assembly.

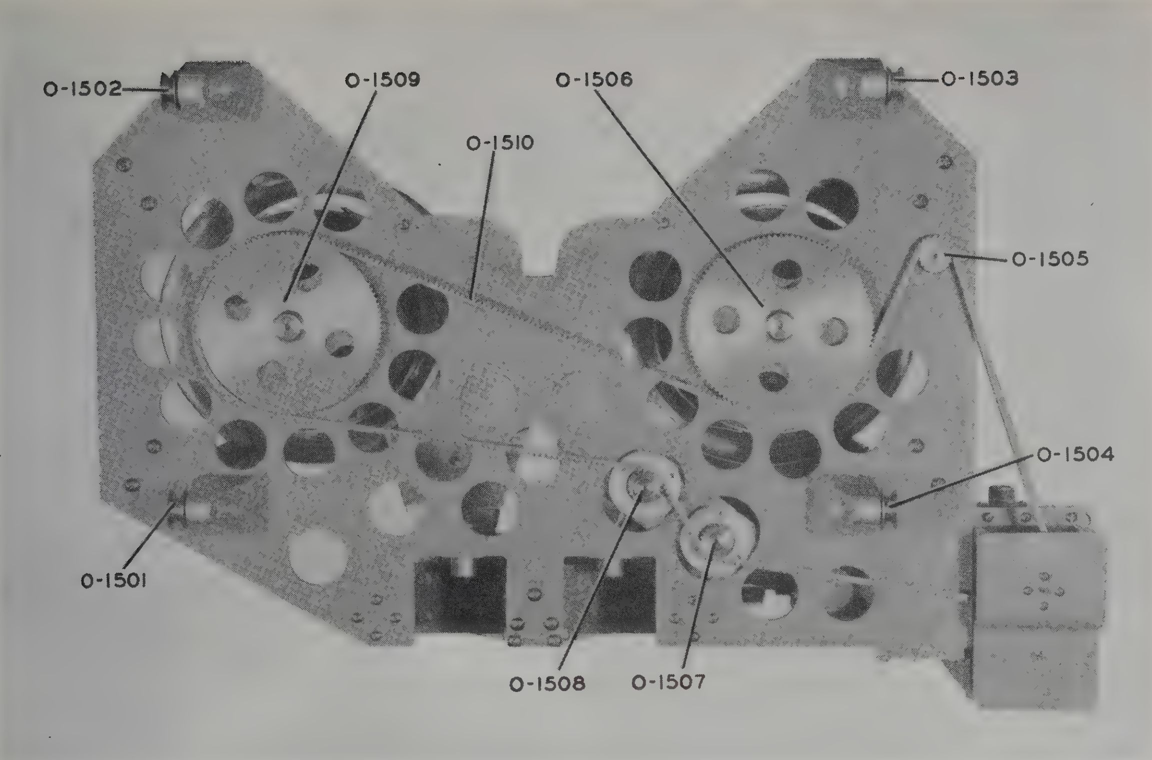


Figure 209. R-F Amplifier AM-738/FRT-22, Antenna Coupling Network, Top View.

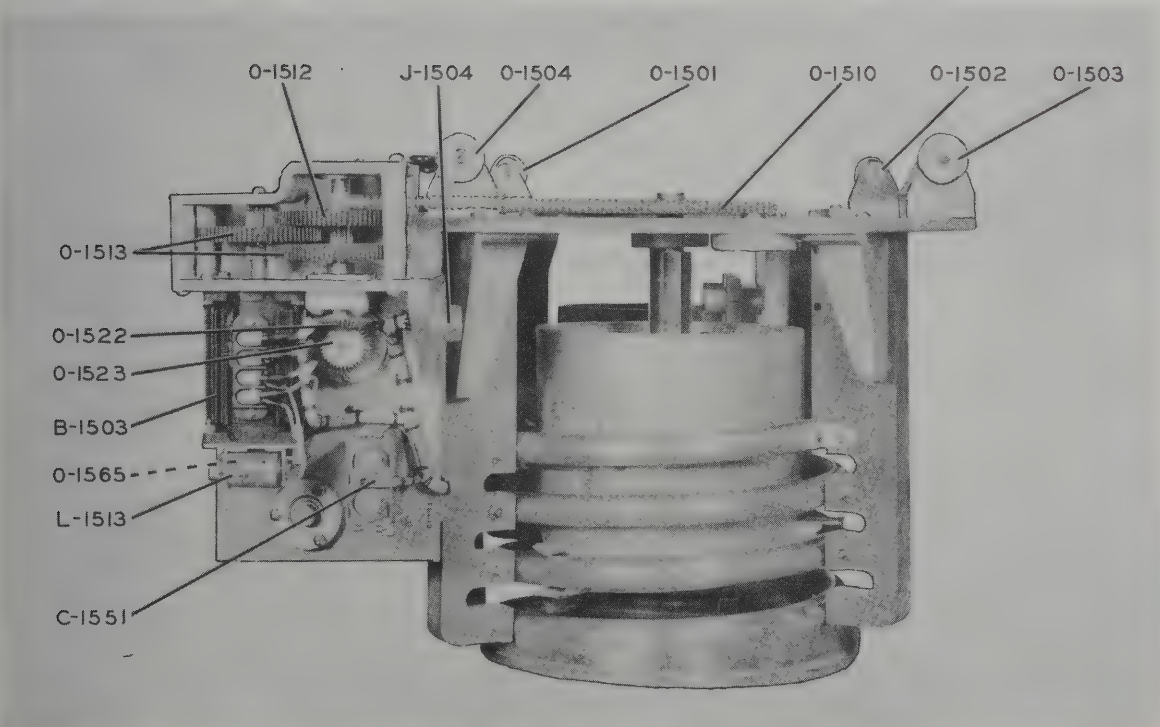


Figure 210. R-F Amplifier AM-738/FRT-22, Antenna Coupling Network, Left-Side View.

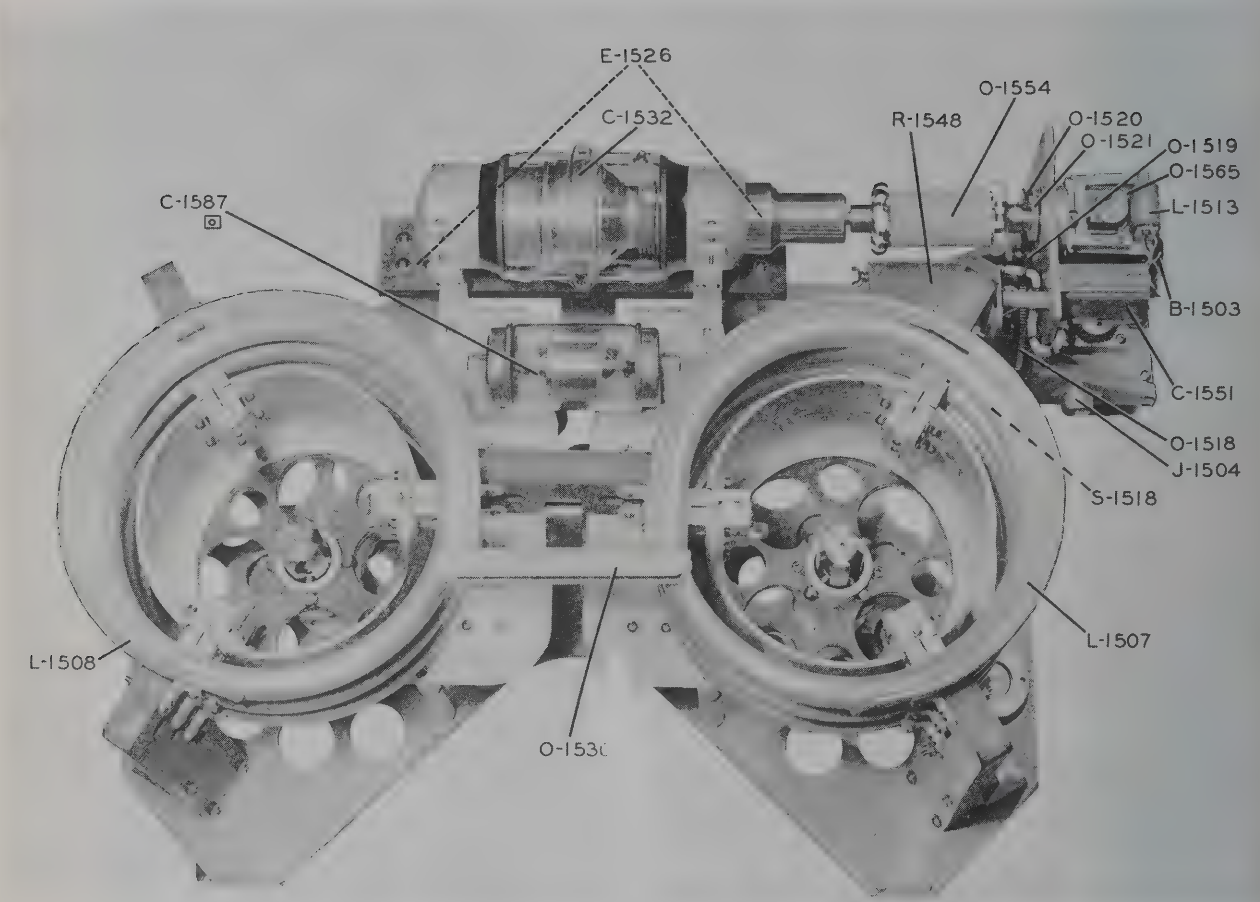


Figure 211. R-F Amplifier AM-738/FRT-22, Antenna Coupling Network, Bottom View.

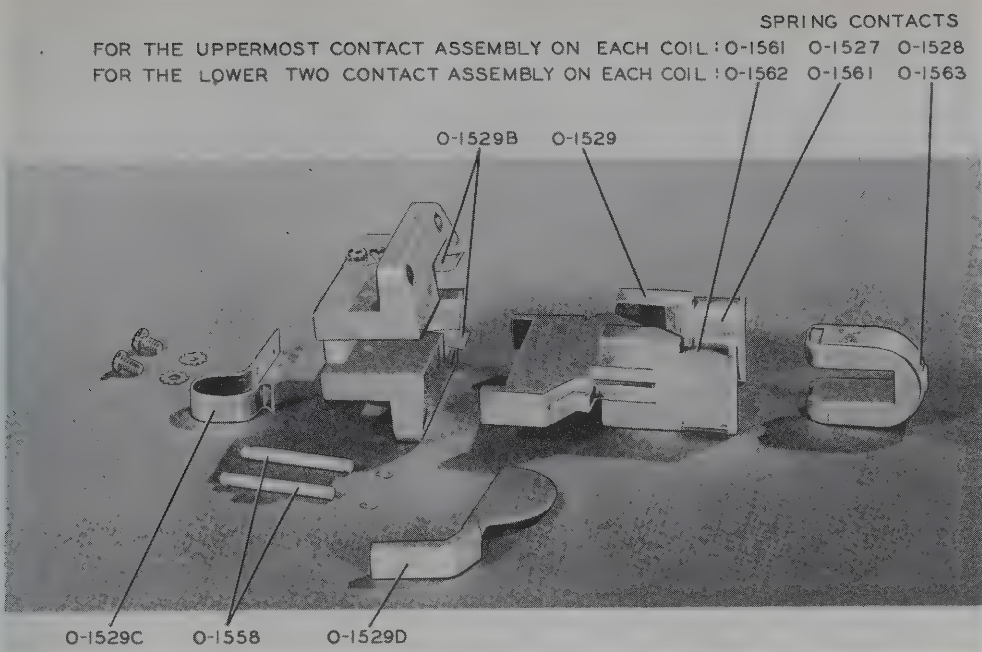


Figure 212. R-F Amplifier AM-738/FRT-22, Antenna Coupling Network Sliding Contact Assembly.

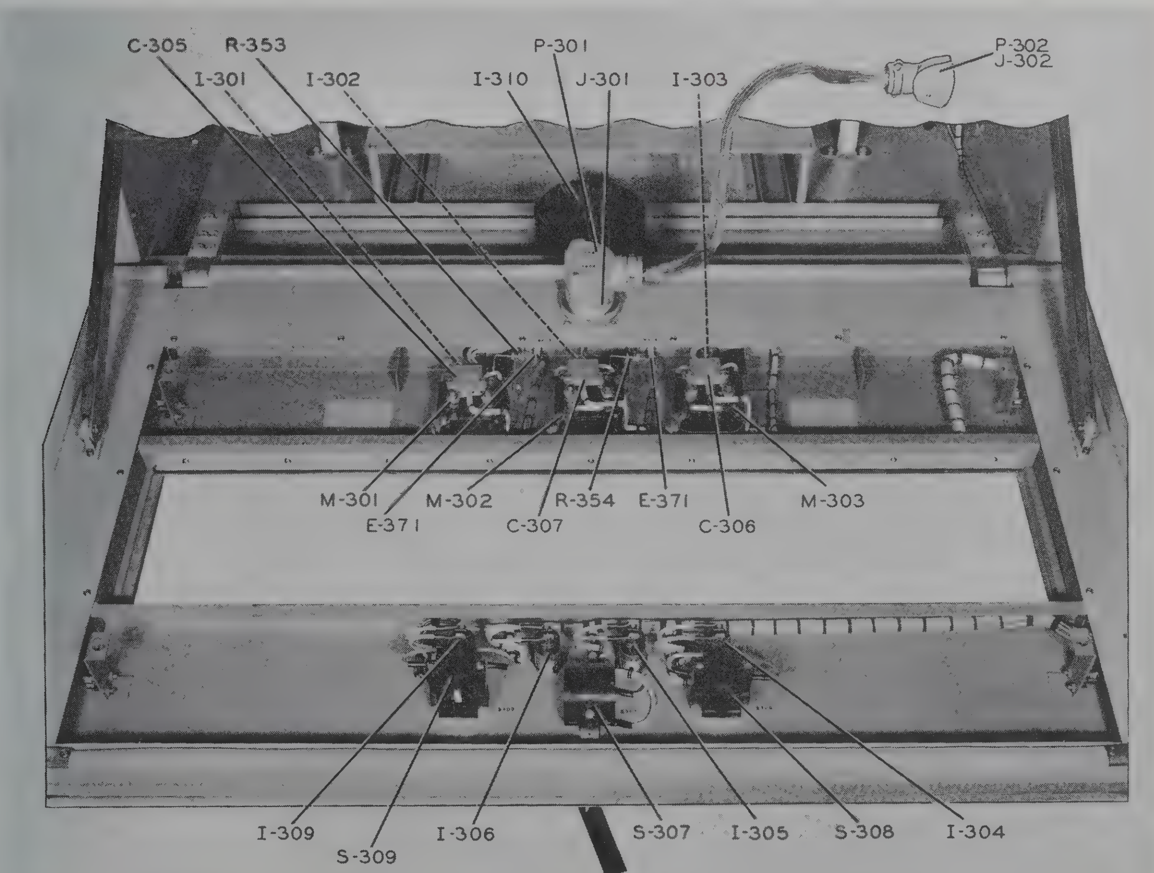


Figure 213. Power Supply Assembly PP-1088/FRT-26, Upper Front Panel, Rear View.

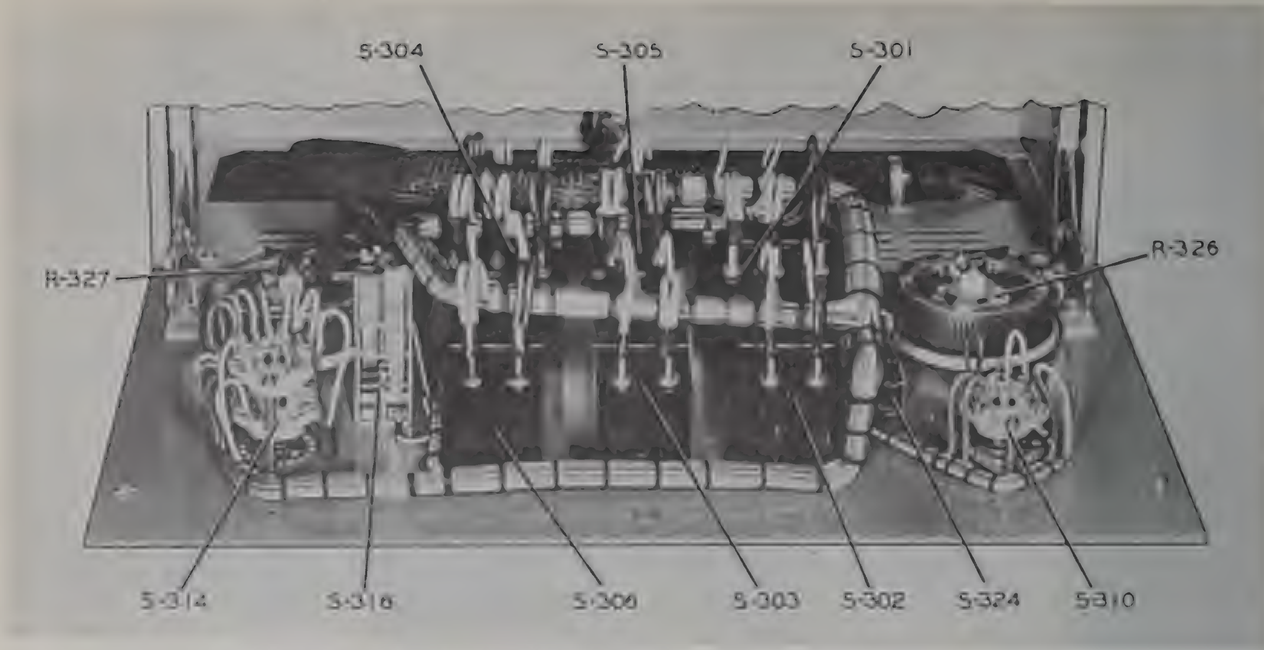


Figure 214. Power Supply Assembly PP-1088/FRT-26, Lower Control Panel, Rear View.

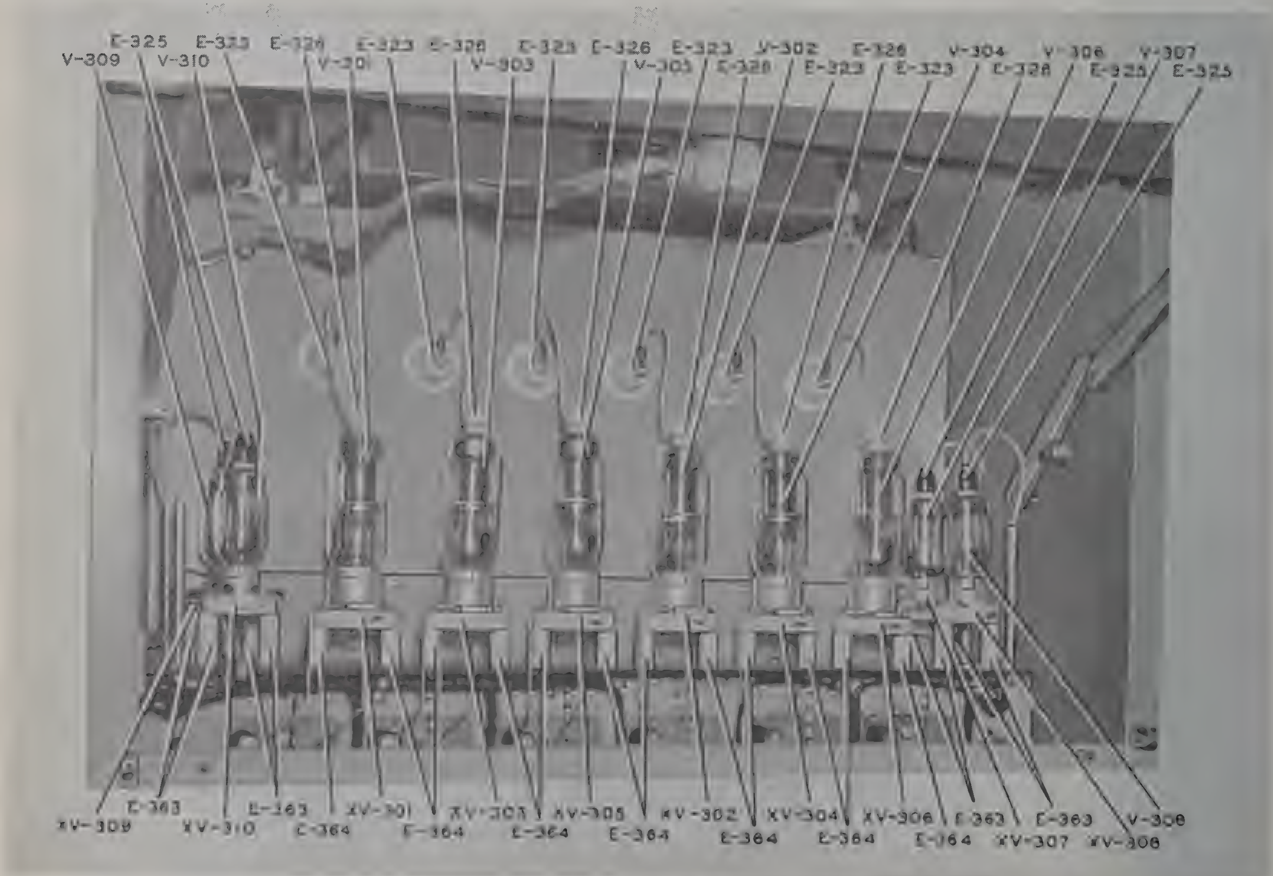


Figure 215. Power Supply Assembly PP-1088/FRT-26, Rectifier Compartment.

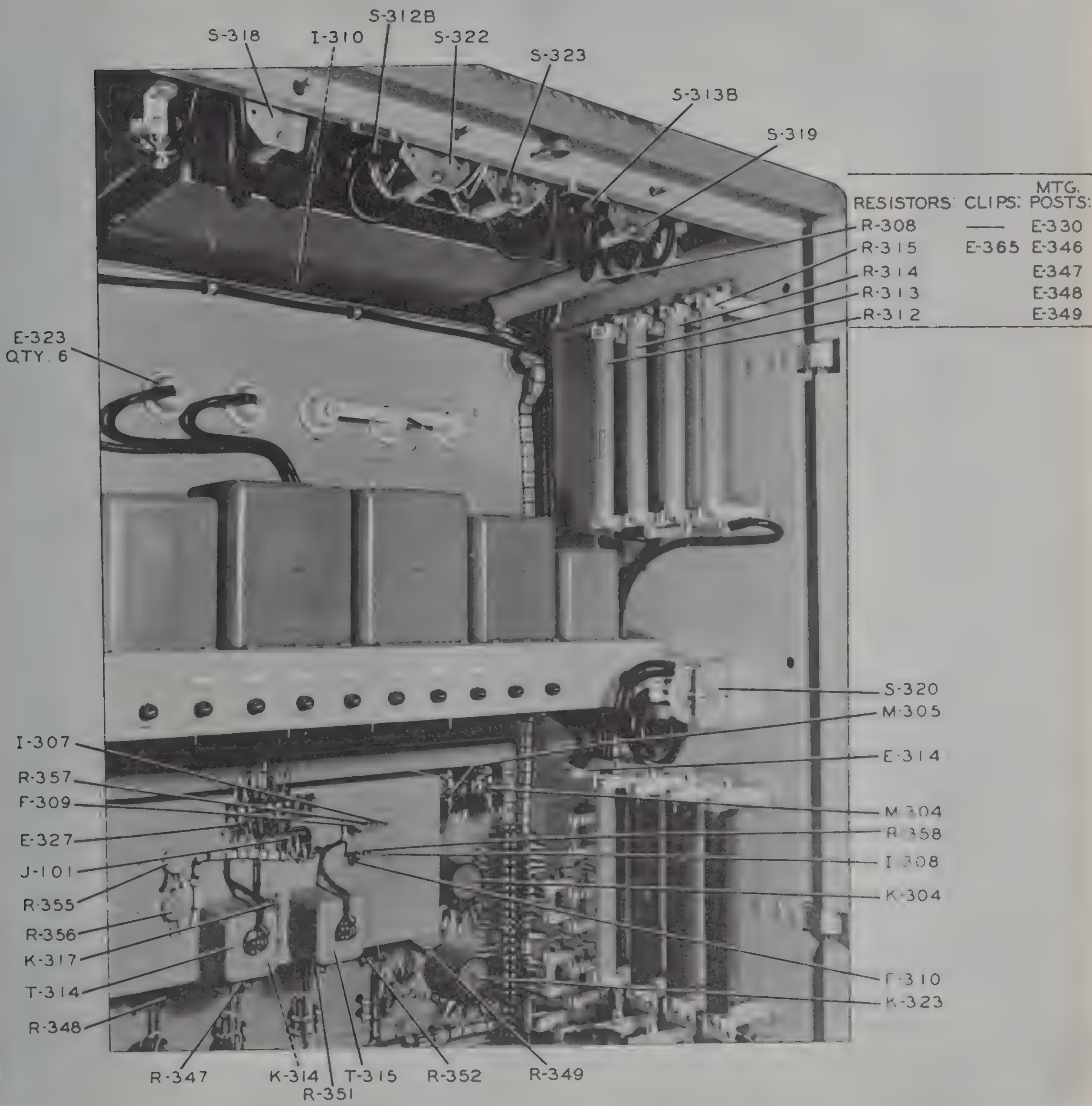


Figure 216. Power Supply Assembly PP-1088/FRT-26, Upper Left-Side Cabinet Wall, Rear View.

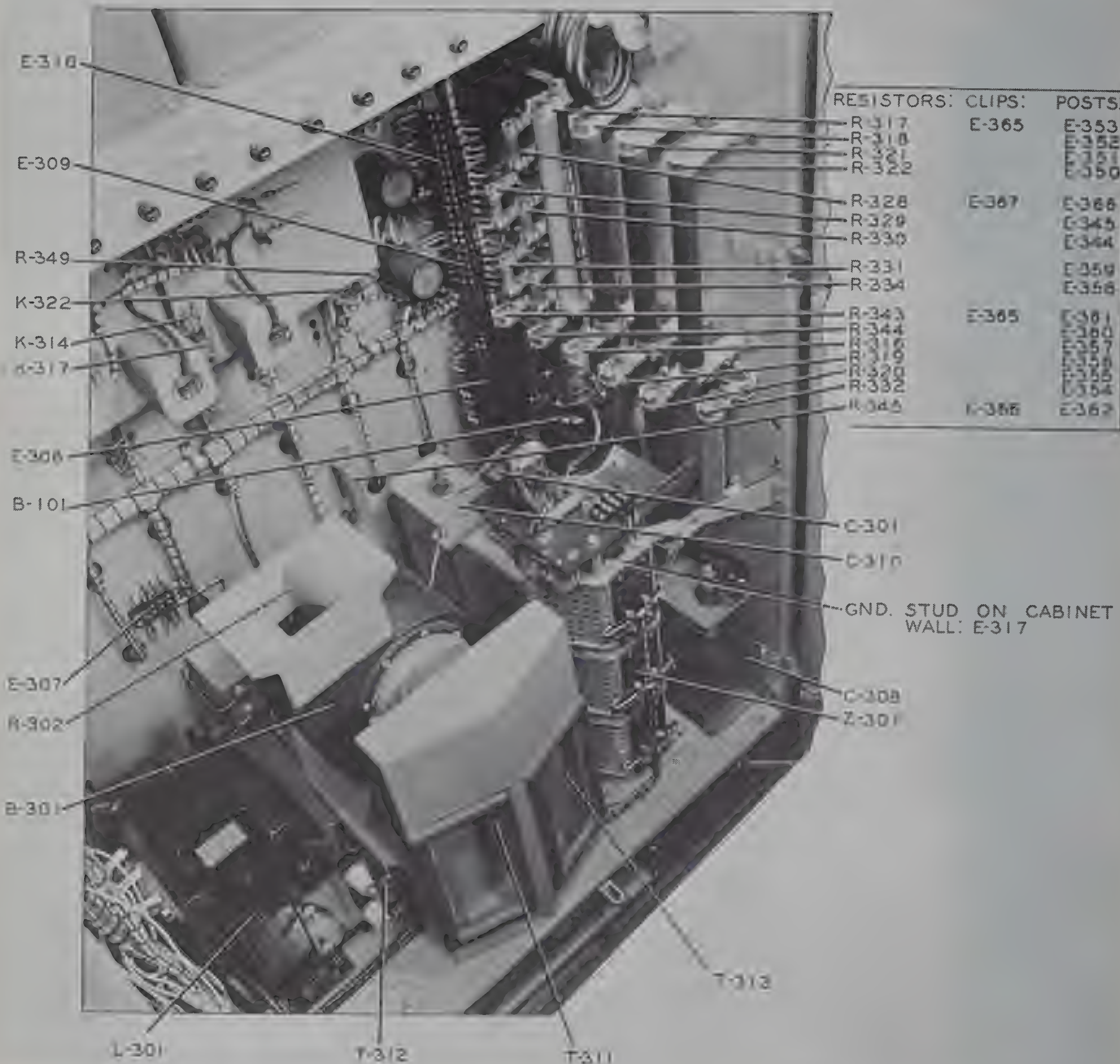


Figure 217. Power Supply Assembly PP-1088/FRT-26, Lower Left-Side Cabinet Wall, Rear View.

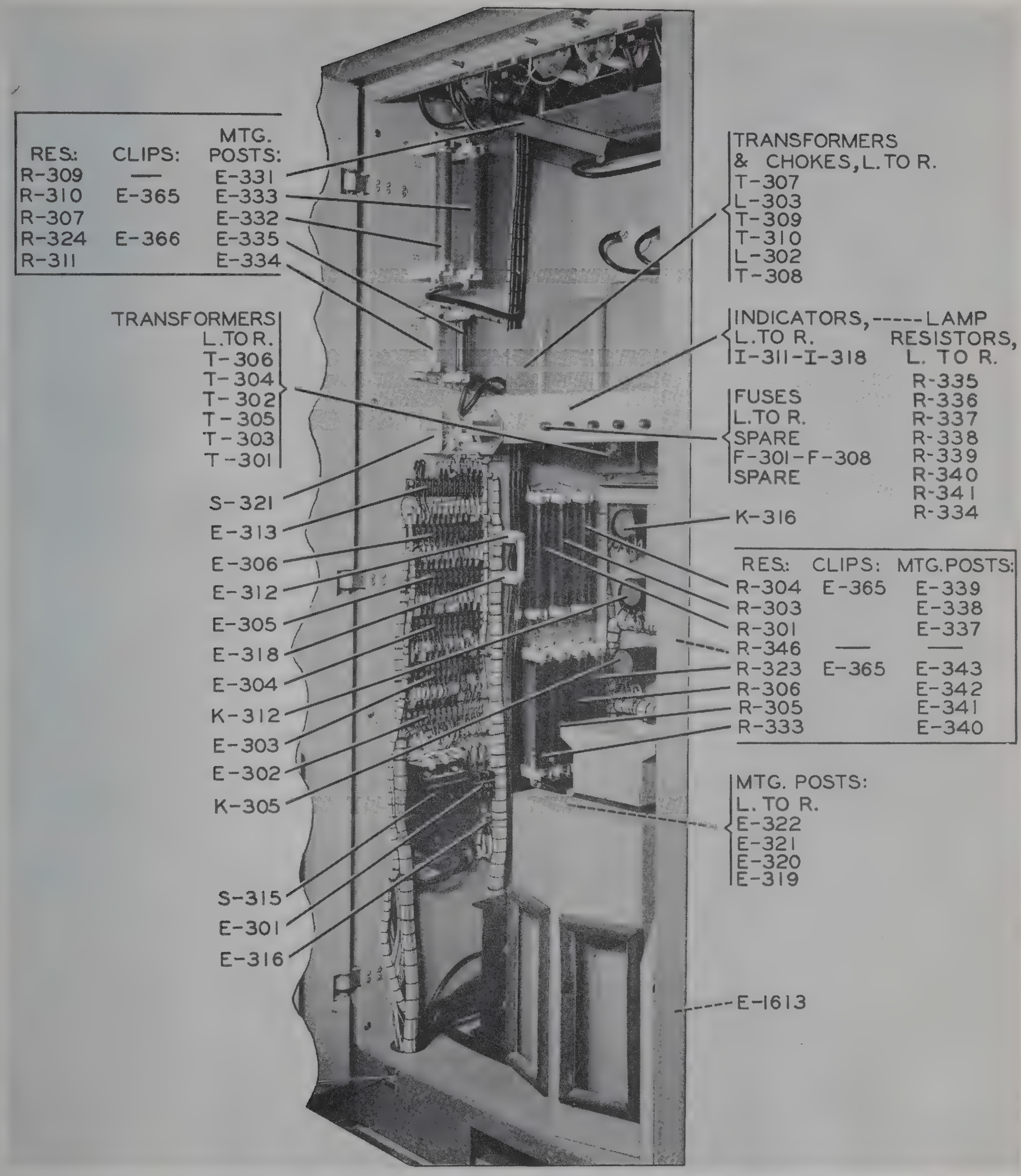


Figure 218. Power Supply Assembly PP-1088/FRT-26, Right-Side Cabinet Wall, Rear View.

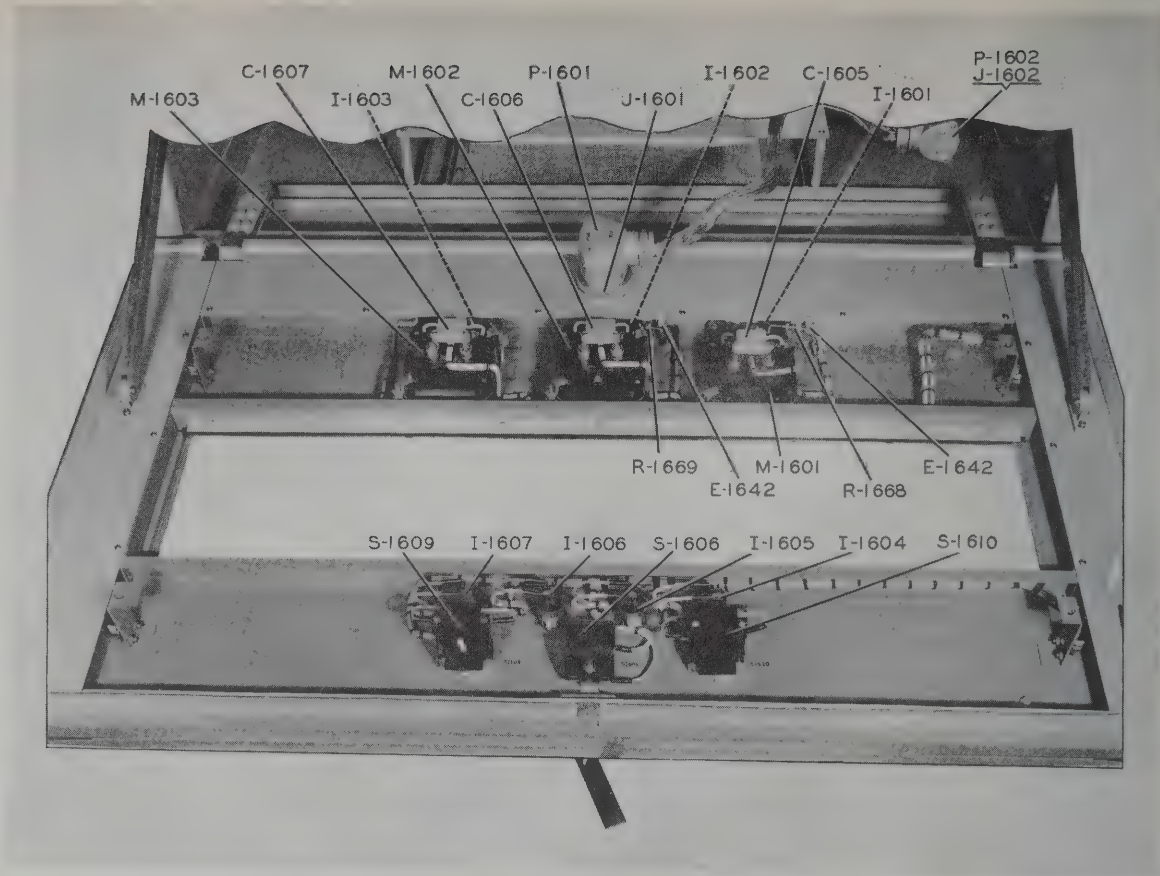


Figure 219. Power Supply Assembly PP-1089/FRT-22, Upper Front Panel, Rear View.

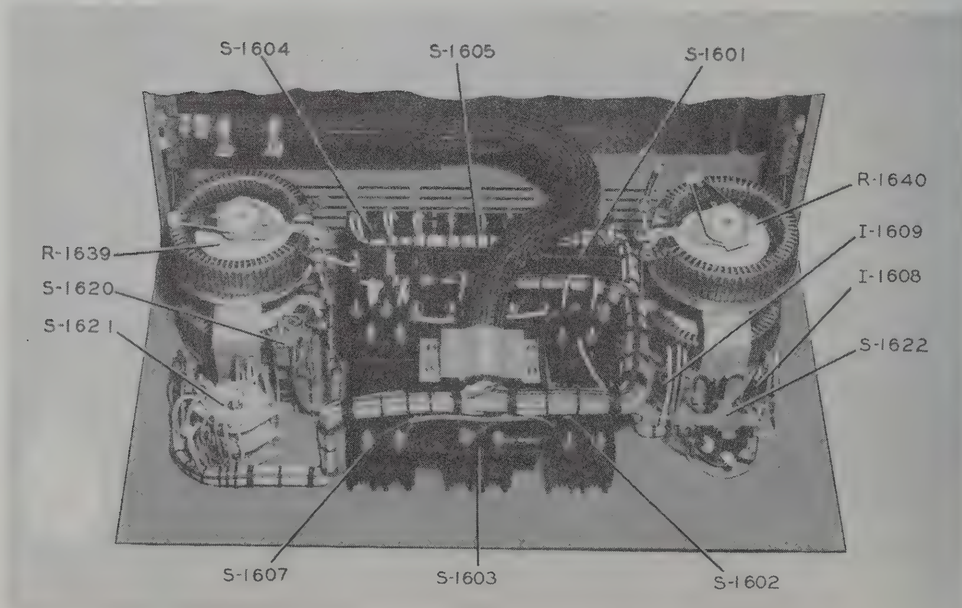


Figure 220. Power Supply Assembly PP-1089/FRT-22, Lower Control Panel, Rear View.

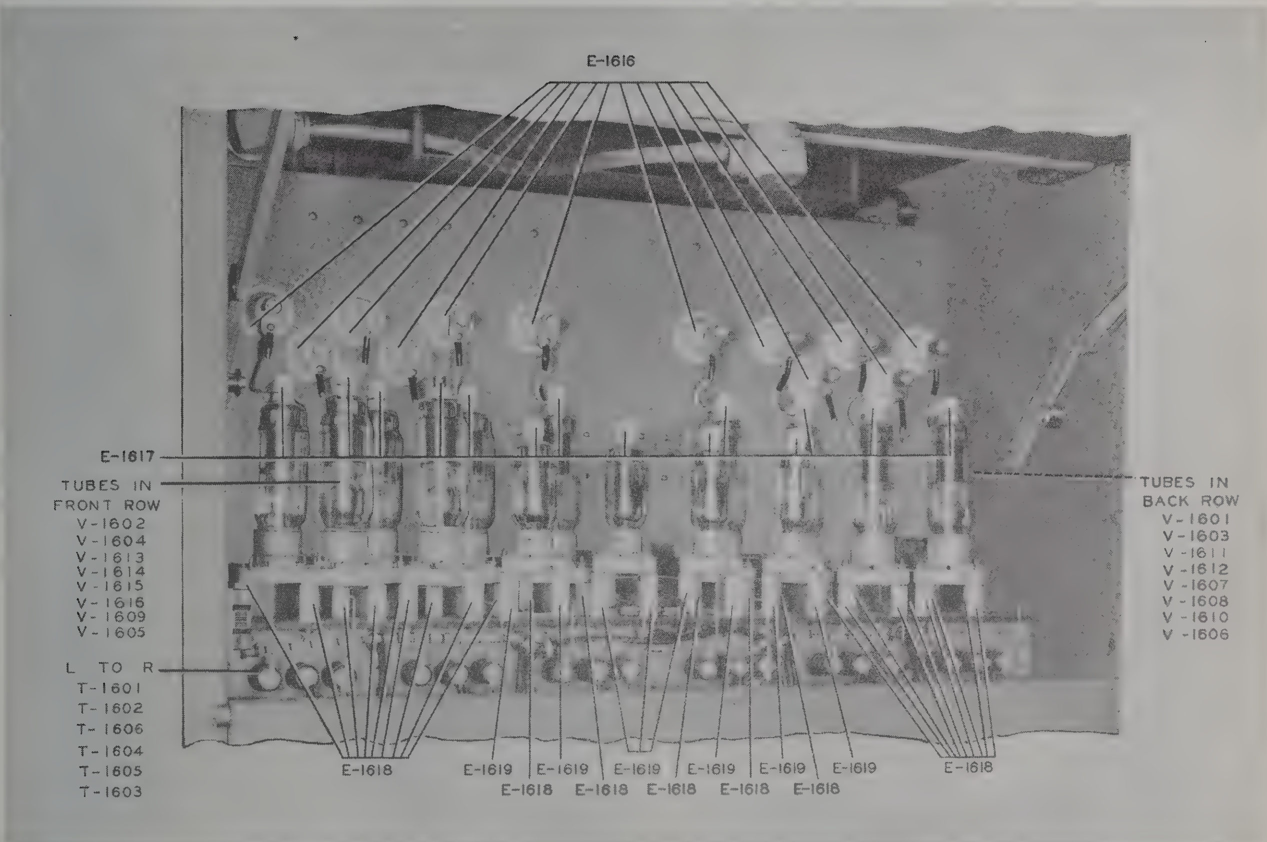


Figure 221. Power Supply Assembly PP-1089/FRT-22, Rectifier Compartment.

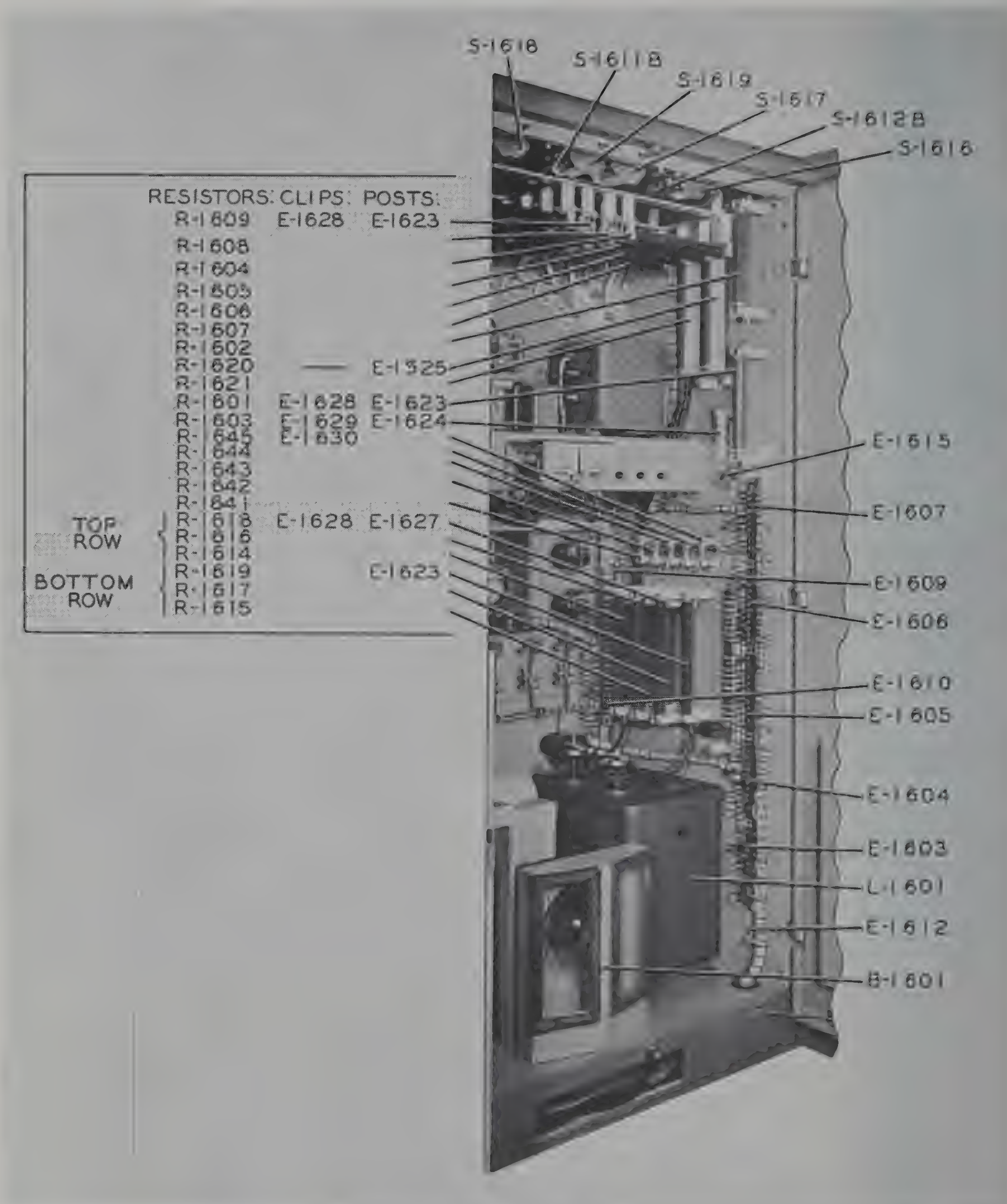


Figure 222. Power Supply Assembly PP-1089/FRT-22, Left-Side Cabinet Wall, Rear View.

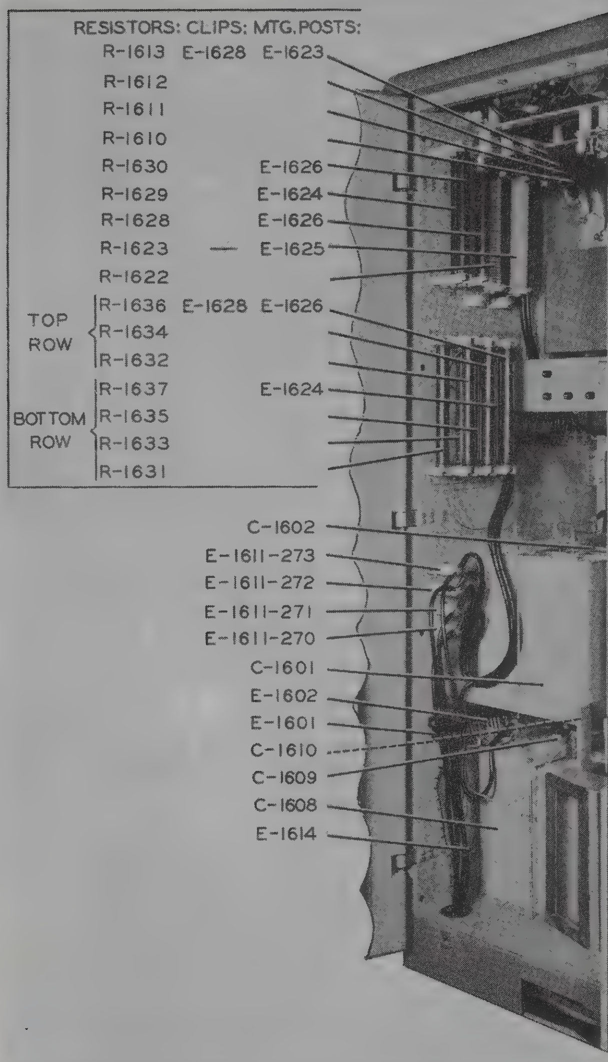


Figure 223. Power Supply Assembly PP-1089/FRT-22, Right-Side Cabinet Wall, Rear View.

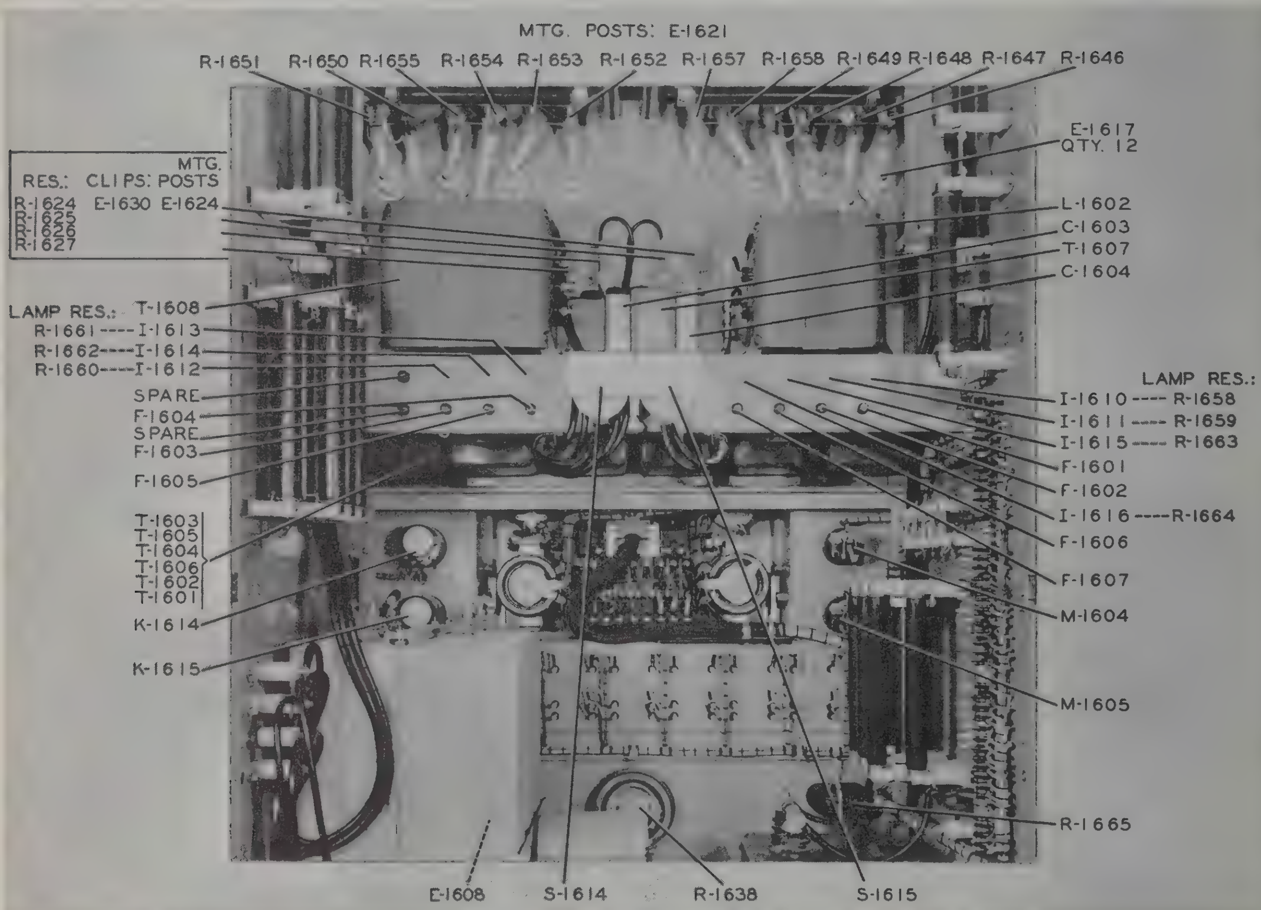


Figure 224. Power Supply Assembly PP-1089/FRT-22, Front Cabinet Wall, Rear View.

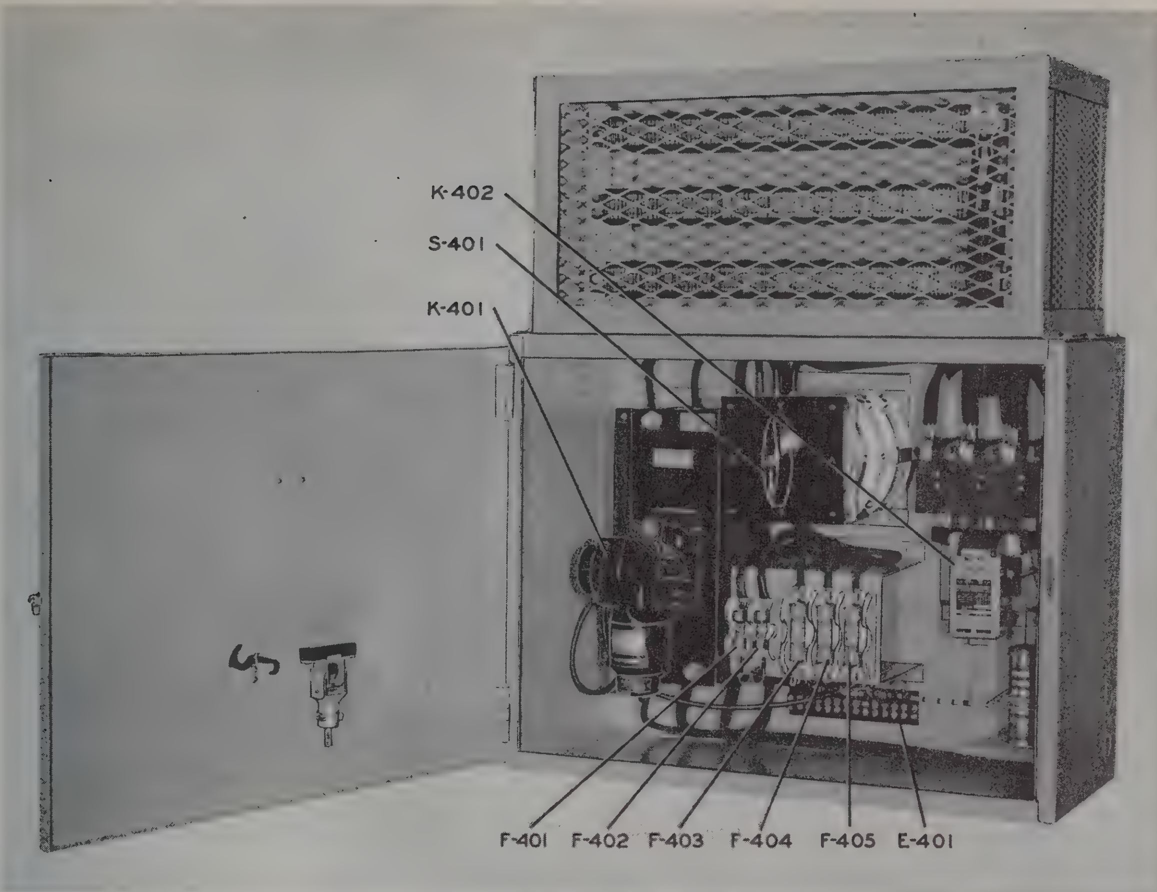


Figure 225. Power Supply Control C-1402/FRT-26, Door Open.

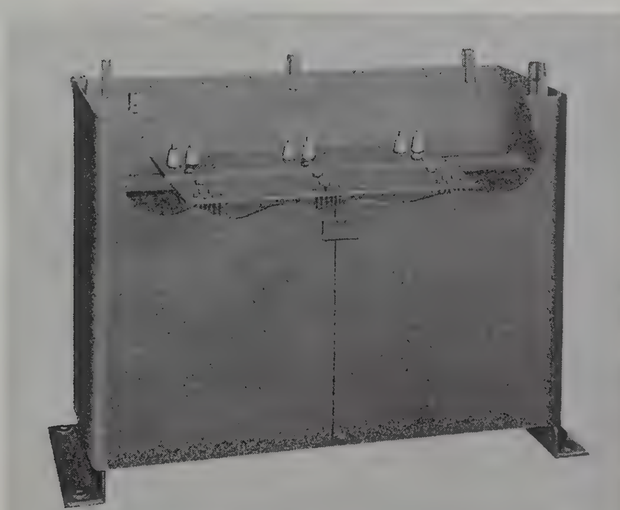


Figure 226. Power Transformer TF-196/FRT-26, Cutaway View.

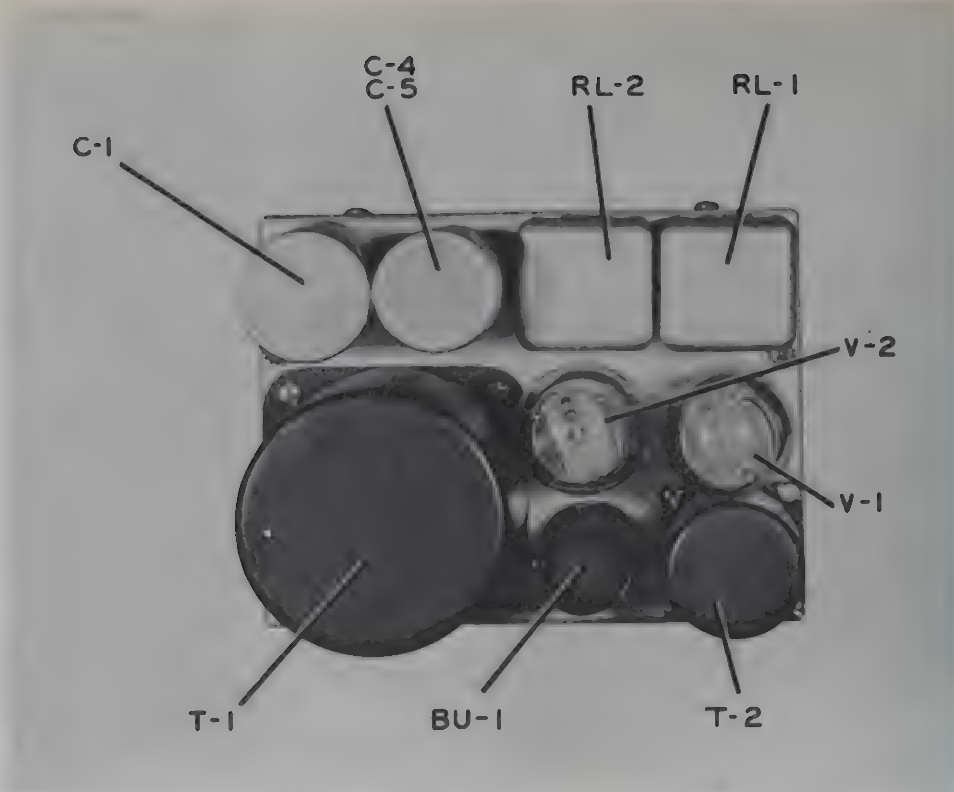


Figure 227. Power Supply Assembly PP-1088/FRT-26, Thyratron Control Unit, Front View.

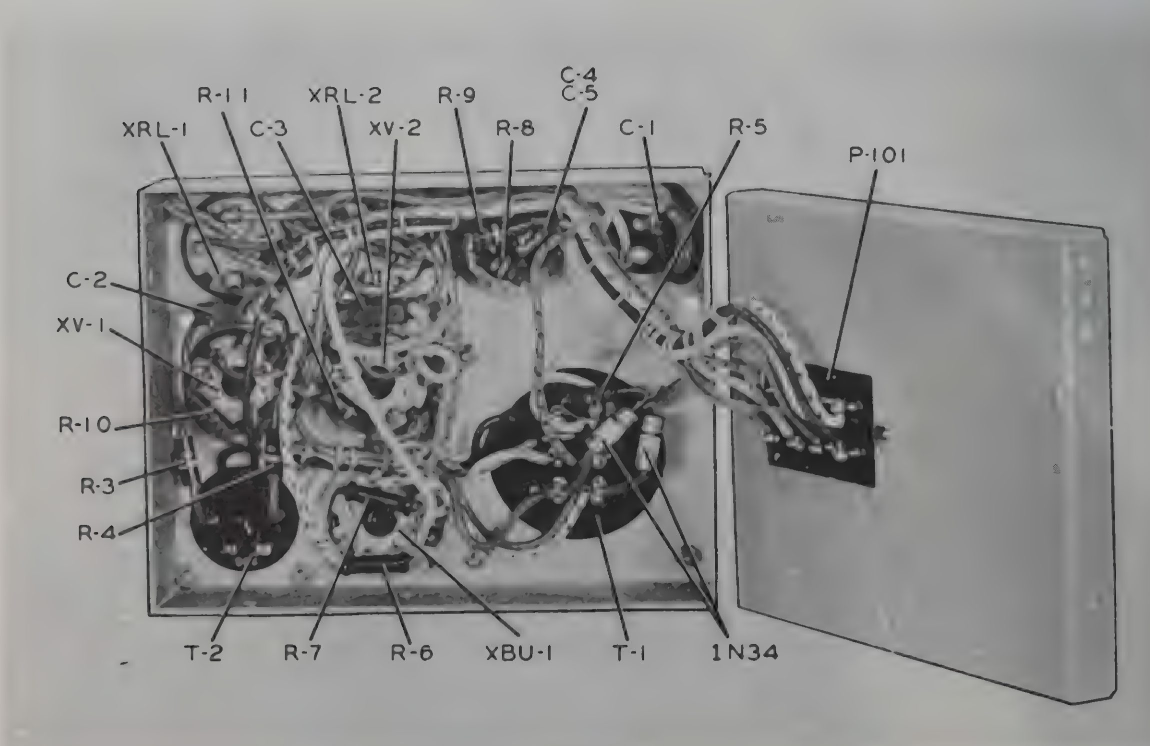


Figure 228. Power Supply Assembly PP-1088/FRT-26, Thyratron Control Unit, Cover Removed, Rear View.

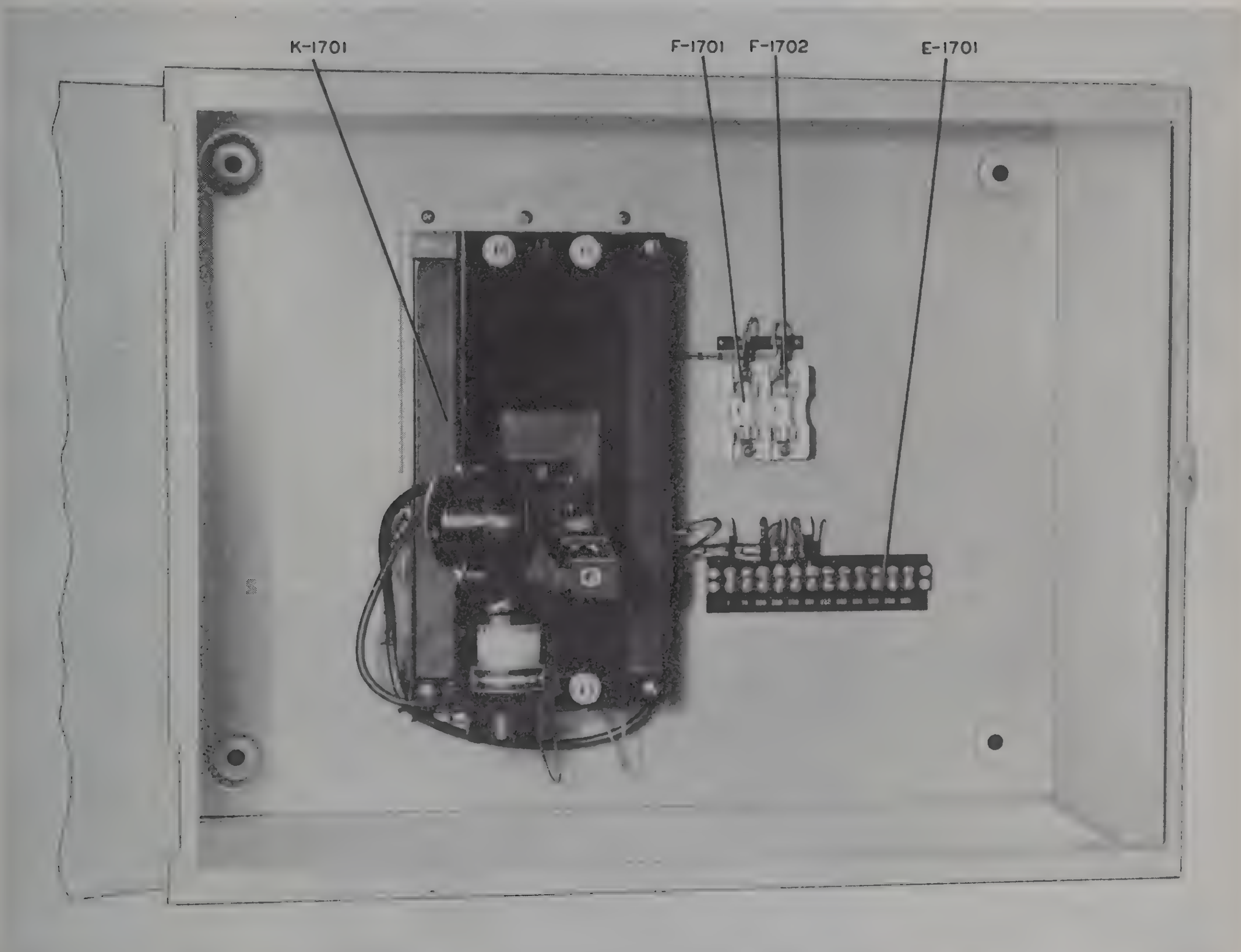


Figure 229. Power Control C-598/FRT-6, Door Open.

Figure 230. Power Transformer TF-197/FRT-22, Door Open, Front View.

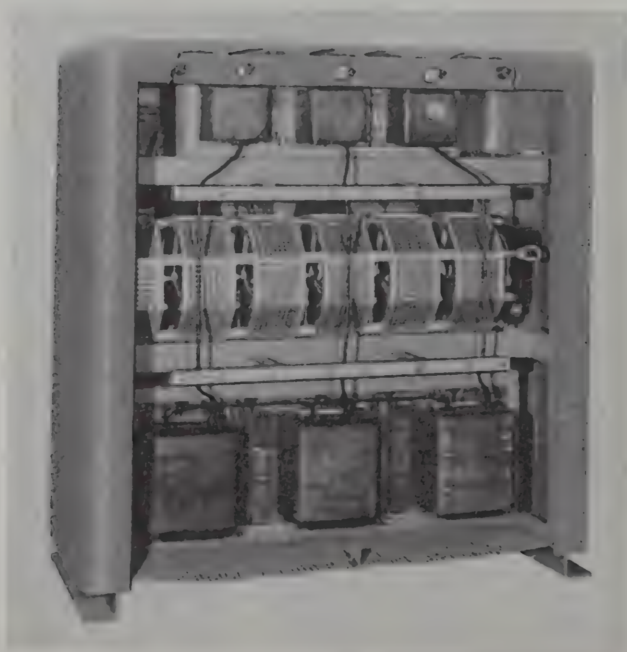


Figure 231. Power Transformer TF-197/FRT-22, Cover Removed, Rear Cutaway View Showing High-Voltage Terminals.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

70. Disassembly

The following instructions are recommended as a guide for preparing Radio Transmitting Set AN/FRT-22 for transportation and storage.

a. To disassemble the equipment in preparation for repacking, refer to paragraph 11, Installation of Components Removed Prior to Shipment, and reverse the instructions given in that paragraph.

b. In removing interconnecting cables, replace and tighten all terminal screws and nuts and their washers. Tag and clearly mark all leads as they are removed, and coil and securely tie all loose lengths of wire and cable with lacing cord or twine.

c. Make a written record of all components and parts removed from the equipment. Later, this may be checked against packing lists.

d. Place all mounting hardware, screws, nuts, washers, etc., in small bags and fasten securely to the components with which they are used. Label the bags if necessary.

e. As a final check, go over the entire transmitter, tighten any loose screws, and tie or fasten anything that is loose or might get free and cause damage.

71. Repacking for Shipment or Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends upon the material available and the conditions under which the equipment is to be shipped or stored. Refer to paragraph 10 and reverse the instructions given in that paragraph.

b. Whenever practicable, place a dehydrating agent such as silica gel inside the cabinets and packing cases. Re-use the original packing materials as far as possible, if new materials are not available.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

72. General

The demolition procedures outlined in paragraph 73 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon the order of the commander.

73. Methods of Destruction

a. Smash. Smash the crystals, controls, tubes, coils, switches, capacitors, motors, transformers, resistors, and all other breakable parts. using sledges, axes, handaxes, pickaxes, hammers, crowbars, or heavy tools.

b. Cut. Cut cords, cables, and wiring, using axes, handaxes, or machetes.

c. Burn. Burn cords, cables, wiring, resistors, capacitors, fibre and plastic parts, and technical manuals, using gasoline, kerosine, oil, flamethrowers, or incendiary grenades.

d. Bend. Bend panels, cabinets, and chassis, using heavy tools, bulldozers, or tanks.

e. Explosives. If explosives are necessary, use firearms, grenades, or TNT.

f. Disposal. Bury or scatter the destroyed parts in trenches, or holes, or throw them into streams or other bodies of water.

g. Destroy everything!

APPENIDIX I

REFERENCES

For availability of items listed, check SR 310-20-3, SR 310-20-4, and SR 310-20-5. Check Department of the Army Supply Catalog SIG 1 for Signal Corps Supply Catalog pamphlets.

1. Army Regulations

AR 380-5	Military Security (Safeguarding Military Information).
AR 750-5	Maintenance of Supplies and Equipment (Maintenance Responsibilities and Shop Operation).

2. Supply Bulletins

SB 11-6	Dry Battery Supply Data.
SB 11-47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11-76	Signal Corps Kit and Materials for Moisture-and Fungi-Resistant Treatment.

3. Auxiliary Equipment and Test Equipment

TM 11-300	Frequency Meter Sets SCR-211-A, B, C, D, E, F, J, K, L, M, N, O, P, Q, R, T, AA, AC, AE, AG, AH, AJ, AK, AL.
TM 11-303	Test Sets I-56-C, D, H, J.
TM 11-307	Signal Generators I-72-G, H, J, K, L.
TM 11-321	Technical Manual for Test Set I-56-E.
TM 11-472	Repair and Calibration of Electrical Measuring Instruments.
TM 11-2613	Voltohmmeter I-666.
TM 11-2624B	Voltohmmeters TS-294/U, TS-294B/U, TS-294C/U.
TM 11-2626	Test Unit I-176, I-176A, and I-176B.
TM 11-2627	Tube Tester I-177 and I-177A.

4. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing.
TB SIG 69	Lubrication of Ground Signal Equipment.

5. Camouflage, Decontamination, and Demolition

FM 5-20	Camouflage, Basic Principles.
FM 5-25	Explosives and Demolitions.
TM 3-220	Decontamination.

6. Other Publications

SR 310-20-3	Index of Training Publications.
SR 310-20-4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, Modification Work Orders, Tables of Organization and Equipment, Reduction Tables, Table of Allowances, Tables of Organization, and Tables of Equipment.
SR 310-20-5	Index of Administrative Publications.
SR 700-45-5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD-247).
SR 745-45-5) NAV DEPT) SERIAL 85P00) AFR 71-4)	Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD-66 (Army), SandA-70-6 (Navy), and AFMC U2 (Air Force)).
TB SIG 4	Methods for Improving the Effectiveness of Jungle Radio Communication.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178	Preventive Maintenance Guide for Radio Communications Equipment.
TB SIG 219	Operation of Signal Equipment at Low Temperatures.
TB SIG 223	Field Expedients for Wire and Radio.

TB 11-499-( )[1]	Basic Radio Propagation Predictions.
TM 11-314	Antennas and Antenna Systems.
TM 11-453	Shop Work.
TM 11-455	Radio Fundamentals.
TM 11-483	Suppression of Radio Noises.
TM 11-486	Electrical Communication Systems Engineering.
TM 11-661	Electrical Fundamentals (Direct Current).
TM 11-681	Electrical Fundamentals (Alternating Current).
TM 11-4000	Trouble Shooting and Repair of Radio Equipment.

[1]A new TB in this series is issued monthly which contains propagation predictions three months in advance.

LIST OF ABBREVIATIONS

ac	alternating current
adj.	adjust
af	audio frequency
AFC	automatic frequency control
AM	amplitude modulation
amp	amperes
amp.	amplifier
ant.	antenna
buff.	buffer
cap.	capacity, capacitor
cath.	cathode
cps	cycles per second
cw	continuous wave
dc	direct current
ext.	external
F.	degrees Fahreneit
fil.	filament
FM	frequency modulation
freq.	frequency
fs.	frequency shift
fsk	frequency-shift keying, frequency-shift keyer
hf	high frequency
hv	high voltage
if.	intermediate frequency
int.	internal
IPA.	intermediate power amplifier
K.	kilohm
kc	kilocycles per second
kv	kilovolts
kva	kilovolt-amperes
kw	kilowatts
lv.	low voltage
ma.	milliamperes
max.	maximum
mc.	megacycles
meg	megohms
min.	minimum
MO	master oscillator
mult.	multiplication, multiplier
osc.	oscillator
PA	power amplifier
ø	phase
PM	phase modulation
pri.	primary
rect.	rectifier
res.	resistance, resistor
rf	radio frequency
rms	root mean square
sec.	secondary
SMO.	stabilized master oscillator
SR	slow-release
SSB	single sideband
swr	standing-wave ratio
uf	microfarads
uuf.	micromicrofarads
v	volts
VTVM	vacuum-tube voltmeter
w.	watts

APPENDIX II

IDENTIFICATION TABLE OF PARTS

Note. The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorizied basis, such as T/O&E, T/A, SIG 7&8, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manual is: SIG 7&8-AN/FRT-22. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1, Introduction and Index.

1. Identification Table of Parts for Radio Transmitting Set AN/FRT-22

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
101-1799 series	RADIO TRANSMITTING SET AN/FRT-22: freq data 4.0 to 26.0 mc freq range, 10 channels, xtal freq; xtal controlled; 40 kw power output; oper power requirements 230 v a-c, 50-60 cyc, 3 ph, 86 kw; 108-1/4" lg x 54-1/2" wd (front to rear) no handles x 91-9/16" h o/a; mtd in metal cabinet; preselected tuning, contains 10 preset channels, tunable from 4.0 to 26.0 mc; 5 special features data (optional) c/o 1 Sig C RF Amplifier AM-738/FRT-22, 1 Sig C Power Supply Control C-1402/FRT-26, 1 Sig C Power Control C.-598/FRT-6, 1 Sig C Frequency Shift Keyer KY-45/FRT-5, 1 Sig C RF Oscillator O-91/FRT-5, 1 Sig C RF Oscillator O-270/FRT-26, 1 Sig C Power Supply PP-454/FRT-5, 1 Sig C Power Supply Assembly PP-1088/FRT-26, 1 Sig C Power Supply Assembly PP-1089/FRT-22, 1 Sig C Radio Transmitter T-454/FRT-26, 1 Sig C Power Transformer TF-196/FRT-26, 1 Sig C Power Transformer TF-197/FRT-22; used for communication; MIL-R-11181 (Sig C); Collins Rad.	F3 type of emission.	2S2003-22
301-399 series	POWER SUPPLY ASSEMBLY PP-1088/FRT-26: 2 power supplies; 1 partial, less transformer; individual power supply data, bias supply rectifier, 400 v output, .80 amp d-c; L-V supply rectifier, 600 v output, .210 amp; h-v supply rectifier, 5500-6000 v output, 4.5 amp d-c; oper power requirements 230 v a-c, 60 cyc, bias supply single ph, L-V single ph, h-v three ph; case data, sheet metal, enamel over zinc chromate priming; 43" lg x 40-1/4" wd x 72" h o/a; no disturbance suppression filter; cabinet mtg; for supplying power to radio transmitter; MIL-R-11181 (Sig c); Collins Rad.	For supplying power to radio transmitter.	3H4497-490

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
401-499 series	POWER SUPPLY CONTROL C-1402/FRT-26: remote control from front of transmitter; plate control, tune-operate; welded steel cabinet; enamel over zinc chromate priming; 30-1/4" lg x 14-1/4" wd x 38-1/4" h o/a; four 1/2" dia holes, 20" x 26" mtg/c (wall mtg); contains v dropping resistors for plate-tune operation; MIL-R-11181 (Sig C); Collins Rad; for 50 cyc operation - 504 9760 005, for 60 cyc operation - 503 8550 005.	Controls intermediate stage plate power to transmitter.	3H1099-587
T401	POWER TRANSFORMER TF-196/FRT-26: enclosed in grounded ventilated sheet steel case: input 215-245 v a-c, 50-60 cyc, 3 ph; 3 output wnd, 2575 v rms approx ea ph, 4 amp per ph, taps at 90% of ea wnd; insulation - test v 19 kv air ins class B insulation; air cooled; 40-1/2" lg x 19-1/8" wd x 31-3/4" h o/a; 18 stand-off pillar type terms. (dimensions not available), 7 stud type terms.; L-V - right front; int, h-v - right rear; int; four 9/16" dia holes on 13" x 39-1/2" mtg/c; MIL-R-11181 (Sig C); Westinghouse Electric Corp.	H-v plate.	2Z9618-134
501-599 series 601-699 series 701-799 series 801-899 series 1201-1299 series 1301-1399 series	RADIO TRANSMITTER T-454/FRT-26: 4.0 to 26.0 mc freq range 600 ohms, output impedance; operating power requirements 230 v a-c, 50-60 cyc, 3 ph, 35 kw; variable tuning; MIL-R-11181 (Sig C); Collins Rad.	For A 1 emission.	2C6900-225
1001-1099 series	POWER SUPPLY PP-454/FRT-5: electronic; three 5R4GYW-full wave; one 6 x 4 half-wave; output data 250 v d-c, 450 ma, 150 v reg, 250 v nonreg; 6.3 v a-c, 14 amp; input data, 105 v - 125 v a-c, 60 cyc, single ph, 500 w; 19" lg x 15-1/8" wd x 8-3/4" h o/a; filter incl; rack mtd; MIL-R-11181 (Sig C); Collins Rad.	General purpose use for FRT equipment.	3H4497-454
1101-1199 series	RF OSCILLATOR O-270/FRT-26: freq data; 2.0 to 4.5 mc, 1 band, 10 crystal controlled channels, crystal freq; power output 2 w; operating power requirements 110 v a-c, freq 50-60 cyc, single ph, 20 w, 600 v d-c thru 6300-ohm resistor, 50		2C2709-22

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	mils; integral coils; 19" lg x 10-13/16" wd x 5-1/4" h o/a; rack mtd; remote controlled from transmitter; MIL-R-11181 (Sig C); Collins Rad.		
101-299 series	RF OSCILLATOR O-91/FRT-5: freq. range 2 to 4.5 mc; 1 band; 10 channels; 2 w power output; operating power requirements; 115 v, 50-60 cps, single ph, 75 w; plate supply 250 v; 19" lg x 15-1/8" w x 10-1/2" h; for 19" relay rack duty; Collins Rad.		2C2709-91
1401-1499 series	FREQUENCY SHIFT KEYER KY-45/FRT-5: 240 dot cycles per second max speed; electronically controlled keying; operating power requirements, d-c, -400 v bias supply +600 v L-V supply, 50 mils, bias supply; 100 mils, L-V supply; aluminum case zinc chromate with enamel finish; 19" lg x 15-1/8" wd x 10-1/2" h o/a; rack mtd in r-f bay; MIL-R-11181 (Sig C); Collins Rad; p/o general purpose Sig C Radio Transmitting Set AN/FRT-5, AN/FRT-6, AN/FRT-22.	For keying transmitter AN/FRT-22.	2C640-45
1501-1599 series	RF AMPLIFIER AM-738/FRT-22: 4.0 mc to 6.0 mc; output; 40 kw, 600 ohms balanced; input; 8 kw, 100-200 ohms; operating power requirements 230 v a-c, 50-60 cyc, 3 ph, 70 kw; 5500 v d-c, 12 amp; mts in steel cabinet; MIL-R-11181 (Sig C); Collins Rad.	General purpose use for FRT equipment only.	2C449-350
1601-1699 series	POWER SUPPLY ASSEMBLY PP-1089/FRT-22: 1 power supply; 1 partial, less transformer; bias supply, rectifier, 500 v output, 1.5 amp d-c; h-v supply rectifier 5500-6000 v, 11 amp d-c; operating power requirements 230 v a-c, 60 cyc, bias supply - single ph, h-v - three ph; case; sheet steel w/enamel over zinc chromate priming; 43" wd x 40-1/4" d x 72" h o/a; no disturbance suppression fil; cabinet mtg; for supplying power to radio transmitter; MIL-R-11181 (Sig C); Collins Rad.	Supplies power to radio transmitter.	3H4497-515
1701-1799 series	POWER CONTROL C-598/FRT-6: remote control from front of transmitter; plate control, welded steel cabinet; enamel over zinc chromate priming; 38-1/2" lg x 14-3/4" wd x 24-1/4" h o/a; four 1/2" dia holes, 20" x 26" mtg/c, centers wall mtd; MIL-R-11181 (Sig C); Collins Rad.	Controls amplifier plate power to transmitter.	3H1097-598
T1701	POWER TRANSFORMER TF-197/FRT-22: enclosed in ventilated grounded sheet steel case; input 230 v 50-60 cyc 3 ph, 3 output wnd, 2575 v rms approx ea ph, 10 amp per ph, taps at 90% of ea wnd; insulation class B, test v 19 kv; air cooled; 57" lg x 30" wd x 60" h o/a; 13 stud type terms. on pri term. board w/5/16"-18 & 1/2"-20 thd, 3 pillar type terms. on secd term. board w/3/8"-16 thd; L-V term. in front, h-v term. in back, int; four 1/2" dia holes on 22" x 53-	H-v plate.	2Z10002-124

1. Identification Table of Parts for Radio Transmitting Set AN/FRT-22 (contd)

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	1/4" mtg/c; no int shielding; special features; motor operated var transformer which raises or lowers the output v under load from 40% below to 10% above nom; MIL-R-11181 (Sig C); Westinghouse Electric & Mfg Co; incl 3 wire reversible motor B-1701, var transformer T-1701A, brushes for var transformer as T-1701B and four limit switches S1701, S1702, S1703, S1704 (mts on floor).		

2. Identification Table of Parts for Power Supply Assembly PP-1088/FRT-26

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
301-399 series	POWER SUPPLY ASSEMBLY PP-1088/FRT-26: two power supplies; one partial, less transformer bias supply, 400 v output .80 amp d-c; L-V supply, 600 v output, .210 amp; h-v supply, 5500-6000 v output, 4.5 amp d-c; a-c, 230 v, 60 cycles, bias supply single ph; low voltage, single phase; high voltage, three phase; 43" lg x 40-1/4" wd x 72" h o/a.	Supply power to radio transmitter.	3H4497-490
B301	BLOWER: centrifugal vane; steel, multiblade, wheel 10-15/16" dia; motor 1/6 hp, 1750 rpm, 50/60 cps single ph, 230 v a-c; 14-3/8" lg approx x 11-3/4" wd x 12-1/2" h o/a; 630 cfm at 1750 rpm; Collins Rad part/dwg #009 1172 00.	Circulates cooling air through the power supply cabinet.	3H388-69
E311	BOARD, terminal: General purpose binding post strip; 4 screw term; 9/16" c to c, w/ barriers; molded phenolic board; 3-7/32" lg x 1-5/16" wd x 5/8" thk o/a; four 0.209" diam mtg holes on 2-13/16" x 1/2" mtg/c; Jones HB type 142.	Blower term block Power Supply Assembly PP-1088/FRT-26.	
W301	CABLE ASSEMBLY, power: 30 cond, ea #18 AWG stranded, 7 strands 1779 cir mil ea, cotton braid, color coded, 3500 v rms test, tinned-copper shielding braid, 288 strands #34 AWG, 11/16" dia o/a; 22" lg excl terminations; Cannonelec connector #IK-30-23C-1 one end, #RIK-30-24C-1-1/8 other end; Collins Rad part/dwg #503 8530 004.	Cable from cabinet to meters and switches on upper front door of Power Supply Assembly PP-1088/FRT-26.	3E4000.146
C305, C306, C307	CAPACITOR, fixed: mica; JAN type #CM50B472M; 4700 uuf ±20%; 2500 vdcw.	C305: Plate voltmeter bypass. C306: Power amplifier fil voltmeter bypass. C307: Line voltmeter bypass.	3K5047224

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C301 (alt), C308 (alt)	CAPACITOR, fixed: paper dielectric; JAN type #CP70D1FR205K; 2 mf ±10%; 7500 vdcw.	High voltage filters.	3DB2-269
C302, C303, C304, C309	CAPACITOR, fixed: paper dielectric; JAN type #CP70E1FG156K; 15 mf ±10%; 1000 vdcw.	C302: Bias supply filter. C303, C304: L-v supply filters. C309: Bias supply filter (for use in single side-band operation).	3DB15-41
K307, K326	CIRCUIT BREAKER: Navy type #-291784; magnetic; cont arrangement, 1 normally open, 1 normally closed; a-c noninductive 115 v, 5 amp; 230 v, 2 amp; 460 v, 1 amp; d-c noninductive 24 v, 5 amp; 48 v, 2 amp; 125 v, 1 amp; 250 v, .3 amp; calibration range .2 to .8 amp, .5 amp continuous; 5-7/16" lg x 2-1/2" wd x 5-13/16" h o/a; instantaneous action. manual reset; GE type #12PJC11AA8.	K307: Bias d-c voltage interlock. K326: Driver d-c overload.	3H900-5-18
K319	CIRCUIT BREAKER: Navy type #-291785; magnetic; cont arrangement 1 normally open, 1 normally closed; a-c noninductive 115 v, 5 amp; 230 v, 2 amp; 460 v, 1 amp; d-c noninductive 24 v, 5 amp; 48 v 2 amp; 125 v, 1 amp; 250 v, .3 amp; calibration range 2 to 8 amp, 6 amp continuous; 5-7/16" lg x 2-1/2" wd x 5-13/16" h o/a; GE #12PJC11AA3.	H-v d-c overload.	3H900-5-28
K324, K325	CIRCUIT BREAKER: Navy type #-291732; magnetic; cont arrangement, 2 normally closed; a-c noninductive 115 v, 5 amp, 230 v, 2 amp; 460 v, 1 amp; d-c noninductive 24 v, 5 amp; 48 v, 2 amp; 125 v, 1 amp; 250 v, .3 amp; calibration range 1 to 4 amp, 3 amp continuous; 5-7/16" lg x 2-1/2" wd x 5-13/16" h o/a; GE model #12PJC11AA2.	Power amplifier d-c overload.	3H900-5-29
S301	CIRCUIT BREAKER: Navy type #-291793; Magnetic; three pole; 230 v, 5.0 amp a-c, 250 v d-c; 5-1/4" lg x 2.984" wd x 4-9/32" d o/a; 5 sec. time delay; toggle action manual reset; Heinemann catalog #3363S.	Blower breaker.	3H900-5-21
S302	CIRCUIT BREAKER: Navy type #-291792; magnetic; double pole; 230 v, 5 amp; a-c, 250 v d-c; 5-1/4" lg x 2" wd x 4-9/32" d o/a; 5 sec. time delay; toggle action manual reset; Heinemann catalog #2232S.	L-v and bias breaker.	3H900-5-24
S303	CIRCUIT BREAKER: Navy type #-291791; magnetic; double pole; 230 v, 15 amp a-c, 250 v d-c; 5-1/4" lg x 2" wd x 4-9/32" d o/a; 5 sec. time delay; toggle action manual reset; Heinemann catalog #2263S.	Control circuit breaker.	3H900-15-46

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
S304	CIRCUIT BREAKER: Navy type #-291794; magnetic; three pole; 230 v, 6.3 amp a-c, 250 v d-c; 5-1/4" lg x 2.984" wd x 4-9/32" d o/a; 5 sec. time delay; toggle action manual reset; Heinemann catalog #3363S.	Low power filament breaker.	3H900-6.3-1
S305	CIRCUIT BREAKER: Navy type #-291789; magnetic: double pole; 230 v, 8.0 amp a-c, 250 v d-c; 5-1/4" lg x 2" wd x 4-9/32" d o/a; 5 sec. time delay; toggle action manual reset; Heinemann catalog #2263S.	Power amplifier filament breaker.	3H900-8-5
S306	CIRCUIT BREAKER: Navy type #-291790; magnetic; double pole; 230 v, 2 amp, a-c, 250 v d-c; 5-1/4" lg x 2" wd x 4-9/32" d o/a; 5 sec. time delay; toggle action manual reset; Heinemann catalog #2263S.	Servo control power.	3H900-2-6
S315	CIRCUIT BREAKER: De-ion air type; triple pole; 50 amps at 230 v AC; phenolic case; 6" h x 4-1/8" wd x 3-31/32" lg o/a; three .196" diam mtg holes cbr 11/32" diam x 1/4" d on ea end spaced 1-3/8" c to c; Wemco S#999-026.	Breaks primary line.	
O301	CLEANER, air: industrial type; 16 Ga. steel, zinc chromate painted w/medium gray enamel surrounding crimped galv mesh wire; 20" lg x 10" wd x 2" thk o/a; element replaceable; Collins Rad spec #009 1234 00.	Dust filter.	
E325	CLIP, electrical: 1-7/32" lg x 1" dia o/a; Alden type 92RT-Special.	Plate cap insulator for V307, V308, V309, V310.	2Z2712.186
E326	CLIP, electrical: 1-1/2" lg x 13/16" wd x 13/16" thk o/a; solder lug connection; Natl Co. #SPP-9.	Plate cap insulator for V301 to V306 incl.	2Z2725.2
E365	CLIP, electrical: 1-9/32" lg x 1-5/32" wd x 23/32" thk o/a; Multi Electric Co. type #2026-S.	Resistor clips.	2Z2712.203
E366	CLIP, electrical: 1-5/32" lg x 3/4" wd x 23/32" thk o/a; Multi Electric Co. type #2022-J.	Resistor clips.	2Z2712.420
E367	CLIP, electrical: 13/16" lg x 5/8" wd x 19/32" thk o/a; Multi Electric Co. type #2020-J.	Resistor clips.	2Z2712.421
K301F, K302D, K303D, K306D, K308F, K311F, K313D, K320F, K321D	COIL, relay: 220 v, 50 cps; single wnd coil; 1-5/8" lg less term. x 1-5/16" wd x 1" h; 5/8" wd x 7/8" lg min hole through ctr; AB #0A02-B, size 0.	K301F: Filament voltage contactor. K302D: Blower contactor. K303D: Power amplifier filament contactor. K306D: Bias contactor. K308F: L-v d-c contactor.	3C1112-11

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		K311F: Main breaker auxiliary. K313D: Restart interval timer auxiliary. K320F: Nonautomatic restart timer auxiliary. K321D: Lockout alarm auxiliary.	
P301	CONNECTOR, plug: Navy type #-491976; 30 round female pol cont; 90° angle; 3-13/32" lg x 2-29/32" wd x 2-1/2" d o/a; Cannonelec #IK-30-23C-1.	Upper front door cable plug.	2Z3082-134
P302	CONNECTOR, plug: 30 round male pol cont; 90° angle; 2-23/32" lg x 2-9/16" wd x 3-7/16" h o/a; Cannonelec #RIK-30-24C-1-1/8.	Upper front door cable plug.	2Z3046.46
J301	CONNECTOR, receptacle: 30 round pol male cont; 2-5/16" lg x 2-5/16" wd x 27/32" h o/a; Cannonelec type IK-30-32S.	Upper front door cable jack.	2Z3046.47
J302	CONNECTOR, receptacle: Navy type #-491977; 30 round pol female cont; 2-9/16" lg x 2-9/16" wd x 15/16" d less cont; Cannonelec type #RIK-30-31SL.	Upper front door panel jack.	2Z3082-135
J303	CONNECTOR, receptacle: 8 female cont; straight; 1-7/8" lg x 1-3/16" wd x 31/32" h excluding cont; rectangular, phenolic w/black finish; phenolic insert; 2 mtg ears w/.169" diam holes spaced 2-1/2" c to c, one ea ear; Jones HB#SS408AB 1/16.	Connects Z302.	
K301E, K302C, K303C, K306C, K308E, K311E, K313C, K320E, K321C	CONTACT, electrical: movable; shorting bar type; 2 silver cont, round, 1/4" dia x 1/32" thk; straight, 1-1/32" lg x 3/8" wd x 3/32" thk o/a; AB type #X-68996.	K301E: Filament voltage contactor. K302C: Blower contactor. K303C: Power amplifier filament contactor. K306C: Bias contactor. K308E: L-v d-c contactor. K311E: Main breaker auxiliary. K313C: Restart interval timer auxiliary. K320E: Nonautomatic restart timer auxiliary. K321C: Lock-out alarm auxiliary.	2Z3202-1/3
K307A, K319A, K324A	CONTACT, electrical: stationary flexible type; single, conical, silver cont, 5/32" dia x 1/8" thk; cont 5 amp 115 v a-c noninductive load, 2 amp 230 v a-c noninductive load; "L" shape, 1-5/8" lg x 1/4" wd x 3/8" thk; GE type #K-6174439G1.•	K307A: Bias d-c voltage interlock. K319A: H-v d-c overload. K324A: Power amplifier d-c overload.	2Z3193-197
K307B, K319B, K324B	CONTACT, electrical: two round silver cont ea 1/4" dia x 1/32" thk; GE type #6K-174440G-1.	K307B: Bias d-c voltage interlock. K319B: H-v d-c overload. K324B: Power amplifier d-c overload.	2Z3193-198

2. Identification Table of Parts for Power Supply Assembly PP-1088/FRT-26 (contd)

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
K301A, K302A	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; four normally open, lh cont mtd on strip; 10 amp, noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48680.	K301A: Filament voltage contactor. K302A: Blower contactor.	2Z7684/1
K301B, K302B	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; four normally open, rh cont mtd on strip ins; 10 amp noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48681.	K301B: Filament voltage contactor. K302B: Blower contactor.	2Z7684/2
K301C, K306A	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; three normally open, lh cont mtd on strip ins; 10 amp, noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48690.	K301C: Filament voltage contactor. K306A: Bias contactor.	2Z3197A-51
K301D, K306B	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; three normally open, rh cont mtd on ins strip; 10 amp, noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48691.	K301D: Filament voltage contactor. K306B: Bias contactor.	2Z3197A-52
K303A, K308A	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; three normally open, one normally closed, lh cont mtd on ins strip; 10 amp, noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48698.	K303A: Power amplifier filament contactor. K308A: L-v d-c contactor.	2Z3197A-45
K303B, K308B	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; three normally open, one normally closed, rh cont mtd on ins strip; 10 amp, noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48699.	K303B: Power amplifier filament contactor. K308B: L-v d-c contactor.	2Z3197A-50
K308C, K313A, K321A	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; 2 normally open, lh cont mtd on ins strip; 10 amp noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48692.	K308C: L-v d-c contactor. K313A: Restart interval time auxiliary. K321A: Lock-out alarm auxiliary.	2Z3197A-49
K308D, K313B, K321B	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; 2 normally open, rh cont; mtd on ins strip; 10 amp, noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48693.	K308D: L-v d-c contactor. K313B: Restart interval timer auxiliary. K321B: Lock-out alarm auxiliary.	2Z3197A-48
K311A	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; 2 normally open, 2 normally closed lh cont mtd on strip; 10 amp; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48682.	Main breaker auxiliary.	2Z3197A-47
K311B	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; 2 normally open, 2 normally closed rh cont mtd on strip; 10 amp; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48683.	Main breaker auxiliary.	2Z3197A-43

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
K311C	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; one normally open, lh cont mtd on ins strip; 10 amp, noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB type #X-48708.	Main breaker auxiliary.	2Z3197A-44
K311D	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; one normally open rh cont mtd on ins strip; 10 amp, noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB #X-48709.	Main breaker auxiliary.	2Z3197A-46
K320A	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; 1 normally open, 3 normally closed lh cont mtd on ins strip; 10 amp; noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB #X-48714.	Nonautomatic restart timer auxiliary.	2Z3197A-106
K320B	CONTACT ASSEMBLY, electrical: p/o AB Bulletin 700 relay; 1 normally open, 3 normally closed rh cont mtd on ins strip; 10 amp, noninductive; 2-3/4" lg x 1-5/16" wd x 1-7/32" thk o/a; AB #X-48715.	Nonautomatic restart timer auxiliary.	2Z3197A-107
Z302	CONTROL, transmitter: incl 3 capacitors, 2 bias rect, 1 bridge lamp, 1 connector, 2 relays, 11 resistors, 2 transf, and 2 tubes; 7-3/8" lg x 4-3/4" wd x 7" h o/a; Superior Elec. to Collins Rad spec #270 1054 00.	Control for Z301.	2C715-40
O 301	FILTER, air conditioning: spun glass dust stop, cartridge type; 10" x 20" x 2"; replaceable element; Owens, I 11 type #2.	Dust filter.	6Z3856-85
F301, F302, F303, F304, F305, F306, F307, F308, F309, F310	FUSE, cartridge: Navy type #-28053-1; 1 amp, blowing time, life at 110%, 1 hr at 135%, 5 to 60 sec at 200% load; 250 v; one time; 1-1/4" lg x 1/4" dia o/a; Littlefuse type 3AG, cat. #1268.	F301 thru F306: In h-v rectifier filament transformer primary circuit. F307: In l-v filament transformer primary circuit. F308: In bias filament transformer primary circuit. F309: In T314 primary circuit. F310: In T315 primary circuit.	3Z2601.16
XF301, XF302, XF303, XF304, XF305, XF306, XF307, XF308, XF309, XF310	FUSEHOLDER: Buss type HKP-Q-LR.	XF301: Holder for fuse F301. XF302: Holder for fuse F302. XF303: Holder for fuse F303. XF304: Holder for fuse F304. XF305: Holder for fuse F305. XF306: Holder for fuse F306.	3Z3282-42.9

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		XF307: Holder for fuse F307. XF308: Holder for fuse F308. XF309: Holder for fuse F309. XF310: Holder for fuse F310.	
I 310	HORN, electrical: Navy type #-10737; electric motor driven; 230 v a-c, 60 cyc, .15 amp; 3-3/8" lg x 6-1/4" dia o/a; painted steel housing; four 1/4" dia mtg holes equally spaced on 1-1/2" rad; Faraday type #2.	Overload lock-out alarm.	4Z4740-3
E323	INSULATOR, bowl: JAN type #NS4W4601; 1-43/64" lg; 2-1/2" o/a OD, 1-9/16" o/a ID, 7/16" dia thru hole, 1-7/8" dia shoulder, 3/4" h on bottom.	Feedthrough for tube caps, Power Supply Assembly PP-1088/FRT-26.	3G3546-01.2
E312, E318 thru E322, E346 thru E353	INSULATOR, standoff: cylindrical pillar; 2" lg; 1" dia, tapped 1/4"-20 x 5/8" d at ea end; Isolantite.	E312: H-v terminals for Power Supply Assembly PP-1088/FRT-26. E318 thru E322: H-v terminals for Power Supply Assembly PP-1088/FRT-26. E346: Mounting insulator for R315. E347: Mounting insulator for R314. E348: Mounting insulator for R313. E349: Mounting insulator for R312. E350: Mounting insulator for R322. E351: Mounting insulator for R321. E352: Mounting insulator for R318. E353: Mounting insulator for R317.	3G350-201
E314, E330 thru E333, E340 thru E343, E355, E356, E357	INSULATOR, standoff: cylindrical; white grade L-4B steatite; 2" lg o/a; 1" OD two tapped 1/4"-20 x 5/8" d mtg holes, 1 ea end; JAN type NS4W0416.	E314: Inter cabinet connections Power Supply Assembly PP-1088/FRT-26. E330 thru E333, E340 thru E343, E355 thru E357: Mounting insulator for R309.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E334, thru E339, E344, E345, E354, E358 thru E362	INSULATOR, standoff: round post shape; JAN type #NS4W0308; 1" lg; 3/4" dia o/a, tapped #10-32 x 3/8" d at ea end.	E334: Mounting insulator for E311. E335: Mounting insulator for R324. E336: Mounting insulator for R328. E337: Mounting insulator for R301. R338: Mounting insulator for R303. E339: Mounting insulator for R304. E344: Mounting insulator for R330. E345: Mounting insulator for R329. E354: Mounting insulator for R332. E358: Mounting insulator for R334. E359: Mounting insulator for R331. E360: Mounting insulator for R344. E361: Mounting insulator for R343. E362: Mounting insulator for R345.	3G3503-08.1
E363	INSULATOR, standoff: round post shape; JAN type #NS 4W0316; 2" lg; 3/4" dia o/a, tapped #10-32 x 3/8" d at ea end.	Mounting insulators for XV307, XV308, XV309 and XV310 (part of S318, S319, S320, S321, S322, S323, S507, S508 and S509).	3G3503-16.3
E364	INSULATOR, standoff: JAN type NS4W0312; grade L-4 ceramic, (steatite) white glazed outer surface, except ends; 1-1/2" lg; JAN spec JAN-I-8.	Mounting insulator.	3G3503-12.2
E371	INSULATOR, standoff: cylindrical pillar; 5/8" lg; 1/4" dia, tapped 4-40 NC-2 x 3/16" d at ea end; Centralab #2X783.	Tie point for R353 and R354.	3G350-128
I 307, I 308, I 311, I 312, I 313, I 314, I 315, I 316, I 317, I 318	LAMP, glow: 110 v to 120 v a-c or d-c, 1/10 w; rectangular translucent white; 1-7/8" lg; Littelfuse #201001.	I 307: Fuse failure indicator for F309. I 308: Fuse failure indicator for F310. I 311: F301 fuse failure indicator. I 312: F302 fuse failure indicator. I 313: F303 fuse failure indicator. I 314: F304 fuse failure indicator. I 315: F305 fuse failure indicator.	2Z5889-27

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		I 316: F306 fuse failure indicator. I 317: F307 fuse failure indicator. I 318: F308 fuse failure indicator.	
E369	KNOB: round; molded black phenolic; for 1/4" dia shaft; double 10-32 NF-2 set-screw; engraved white line 3/16" lg; 1-3/4" dia x 7/8" d o/a; 5/8"d shaft hole; Collins Rad part/dwg #503 2377 002.	Knob for S317.	2Z5824.131
E370	KNOB: round; molded black phenolic; for 1/4" dia shaft; two holes 90° apart tapped 10-32 NF-2; engraved white line 1/4" lg; 2-1/4" dia x 1-17/64" thk o/a; 7/8" d shaft hole; Collins Rad part/dwg #502 9138 002.	Knob for R302.	2Z5824.132
I 301, I 302, I 303, I 304, I 305, I 306, I 309	LAMP, incandescent: 120 v, 6 w; bulb S-6 clear; 1-7/8" lg o/a; double cont bayonet candelabra base; Collins Rad part/dwg #262 0041 00.	I 301: Meter light for M301. I 302: Meter light for M302. I 303: Meter light for M303. I 304: Filament pilot. I 305: L-v pilot. I 306: H-v on pilot. I 309: Overload pilot.	6Z6810-6
XI 301	LAMPHOLDER: double cont candelabra bayonet base socket; 1-9/16" lg x 1" wd x 1-1/8" h o/a; Dialco #9-S-4634-L-46.	Mounts I 301.	2Z5988-39
XI 304A, XI 309A	LENS, indicator light: amber; thd type; 1-3/32" dia smooth glass frosted back lens; bezel 1-9/64" OD x 35/64" lg; Dialco to Collins Rad spec #262 0106 00.	XI 304A: Part of indicator light XI 304. XI 309A: Part of indicator light XI 309.	2Z6125-262
XI 305A	LENS, indicator light: green; thd type; 1-3/32" dia smooth glass frosted back lens; bezel 1-9/64" OD x 35/64" lg; Dialco to Collins Rad spec #262 0105 00.	Part of indicator light XI 305.	2Z6125-263
XI 306A	LENS, indicator light: red; thd type; 1-3/32"dia smooth glass frosted back lens; bezel 1-9/64" OD x 35/64" lg; Dialco to Collins Rad spec #262 0104 00.	Part of indicator light XI 306.	2Z6125-264
XI 304, XI 305, XI 306, XI 309	LIGHT, indicator: w/o lens; double cont candelabra bayonet base bulb; 2-5/8" lg x 1-3/8" OD; Dialco type #51702-67.	XI 304: Mounts I 304. XI 305: Mounts I 305. XI 306: Mounts I 306. XI 309: Mounts I 309.	2Z5991-377

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
M304, M305	METER, time: Navy type #-22375; elapsed time indicator; sync self-starting clock motor; direct reading; 3" lg x 3-1/8" wd x 4-5/8" d o/a; five rotating drum counters, ea calibrated 0 ot 9, w/ window opening face; tenths digit red; operates from 230 v 60 cyc power supply; Weston type 691.	M304: Filament hour counter. M305: Plate hour counter.	3F3359-1
M301	METER, ammeter: d-c; range 0 to 1 ma; rectangular, flush, black bakelite case; 2.75" x 2.88" body, 1.46" d, behind fl, 3" x 3.13" x 3/16" fl; 2% accuracy for full-scale reading; sensitivity approx 1,000 ohms per v; calibrated for 3/32" thk steel panel; scale marked 0 to 8 kv; Weston model 731.	H-v d-c voltmeter.	3F905-23
Z301	POWER SUPPLY SUBASSEMBLY: input 195 v a-c min to 255 v a-c max (230 v a-c nom) 50/60 cyc, 3 ph, wye connected; output 230 v a-c max brush cur 15 amp rms; varies by 1 ph, 115 v, .4 amp, 75 rpm motor; 26-7/8" lg x 9-1/4" wd x 9-1/8" h o/a; Collins Rad part/dwg #664 0082 00.	Line voltage regulator.	2H4497-490-1
L301	REACTOR: filter choke; 2 hy min at 4.0 amp; 9 ohm max at +75° C d-c resistance; 12,000 peak test voltage; 15-3/4" lg x 10-3/4" wd x 11-1/4" h o/a; continuous duty cyc, 342/378 cps ripple freq, 350 ripple v; Wemco type # S.O.19-u-355.	H-v supply filter.	3C557H-5
L302	REACTOR: Navy type #-304882; filter choke; 3 hy, .75 amp; 25 ohms max d-c resistance; 5,000 v test; 5.260" lg x 6.12" wd x 7.06" h excluding term. and mtg fl; moisture resistant; Chi Trans model #12645.	Bias supply filter.	3C547-53
L303	REACTOR: Navy type #-304888; filter choke; 6 hy, .5 amp; 26-ohm d-c resistance at 25° C; 3,500 v rms test; 7-1/16" h x 6-1/8" wd x 5-17/64" lg excluding term. and mtg fl; moisture resistant; Chi Trans #9825.	L-v supply filter.	3C547-54
K304	RELAY, motor driven: Navy type #-291777; 10 amp 110 v a-c, 5 amp 230 v a-c, 3 amp 440 v a-c; silver cont; 3-3/4" dia x 3-7/8" lg o/a; Cramer RW type TE.	Filament heating time delay.	2Z7599A-263
K305	RELAY, motor driven: Navy type #-291776; 10 amp 110 v, 5 amp 230 v, 3 amp 440 v a-c; silver cont; 3-3/4" dia x 5-1/4" lg o/a; fast acting, adj 15 sec to 5 min; Cramer RW type TEC.	Blower hold-on time delay.	2Z7599A-265
K305 (alt)	RELAY, motor driven: 10 amp 110 v, 5 amp 230 v, 3 amp 440 v a-c; silver cont; 230 v, 50 cyc single ph snychronous motor; 3-3/4" dia x 5-1/4" lg o/a; adj 18 sec to 6 min; Cramer RW type TEC.	Blower hold-on time delay.	2Z7599A-495

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
K312	RELAY, motor driven: Navy type #-291775; 10 amp 110 v, 5 amp 230 v, 3 amp 440 v a-c; silver cont; 3-3/4" dia x 3-7/8" lg o/a; fast acting, adj 0-30 sec; Cramer RW type TE-30S.	Nonautomatic restart timer.	2Z7599A-262
K312	RELAY, motor driven: 10 amp 110 v, 5 amp 230 v, 3 amp 440 v a-c; silver cont; 3-3/4" dia x 3-7/8" lg o/a; adj 1.8 to 36 sec, Cramer RW type TE.	Nonautomatic restart timer.	2Z7599A-496
K316	RELAY, motor driven: Navy type #-291778; 10 amp 110 v, 5 amp 230 v, 3 amp 440 v a-c; silver cont; 3-3/4" dia x 5-1/4" lg o/a; fast acting, adj 45 sec to 15 min; Cramer RW type TEC-TER.	Restart interval timer.	2Z7599A-260
K316	RELAY, motor driven: 10 amp 110 v, 5 amp 230 v, 3 amp 440 v a-c; silver cont; 3-3/4" dia x 5-1/4" lg o/a; adj 54 sec to 18 min; Cramer RW type TEC-TER.	Restart interval timer.	2Z7599A-497
K323	RELAY, motor driven: 10 amp 110 v, 5 amp 230 v, 3 amp 440 v a-c; silver cont; 3-3/4" dia x 5-1/4" lg o/a; adj 90 sec to 30 min; Cramer RW type TEC-TER.	Automatic shut-down timer.	2Z7599A-498
K315 AB	RELAY, rotary: Navy type #-291787; single disk, single row, 38 cont, shorting type cont arm; .5 amp at 230 v a-c; silver cont; 4" lg x 3.260" wd x 3-3/8" h o/a; Guardian Elec series R.	Restart cycle counter stepping coil.	2Z7597-14
K301	RELAY, solenoid: 7 poles normally open; 10 amp, noninductive load at 600 v a-c; silver cont; oper 220 v, 50 cps, 5" lg x 3-1/8" wd x 3-1/8" h o/a; AB type B-700, Bul. 700.	Filament voltage contactor.	2Z7597-19
K302	RELAY, solenoid: 4 poles normally open; 10 amp, noninductive load at 600 v a-c; silver cont; oper 220 v, 50 cps, 3-5/8" lg x 3-1/8" wd x 3-1/8" h o/a; AB type B-400, Bul. 700.	Blower contactor.	2Z7593-5
K303	RELAY, solenoid: 3 poles normally open, 1 pole normally closed; 10 amp, noninductive load at 600 v a-c; silver cont; 3-5/8" lg x 3-1/8" wd x 3-1/8" h o/a; AB type B-310, Bul. 700.	Power amplifier filament contactor.	2Z7593-151
K306	RELAY, solenoid: 3 pole normally open; 10 amp, noninductive load at 600 v a-c; oper 220 v, 50 cps, 3-5/8" lg x 3-1/8" wd x 3-1/8" h o/a; AB type B-300, Bul. 700.	Bias contactor.	2Z7593-150
K308	RELAY, solenoid: 5 poles normally open, 1 pole normally closed; 10 amp, noninductive load at 600 v a-c; silver cont; oper 220 v, 50 cps, 5" lg x 3-1/8" wd x 3-1/8" h o/a; AB type #B-510, Bul. 700.	L-v d-c contactor.	2Z7596-11

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
K311	RELAY, solenoid: 3 poles normally open, 2 poles normally closed; 10 amp, noninductive load at 600 v a-c; silver cont; 5" lg x 3-1/8" wd x 3-1/8" h o/a; AB type B-320, Bul. 700.	Main breaker auxiliary.	2Z7596-12
K313, K321	RELAY, solenoid: 2 pole normally open; 10 amp, noninductive load at 600 v a-c; silver cont; 3-5/8" lg x 3-1/8" wd x 2-5/8" h o/a; AB type B-200, Bul. 700.	K313: Restart interval timer auxiliary. K321: Lock-out alarm auxiliary.	2Z7590-221
K318	RELAY, solenoid: SPDT; 10 amp, 125 v a-c, 5 amp 250 v a-c; silver cont; 7-3/8" lg x 3-7/8" wd x 4-1/4" h o/a; time delay continuously adj .2 sec to 3 min ±10%; Sq D type RO5E, cat. #9050.	Tune resistor shorting contactor auxiliary.	2Z7587-264
K320	RELAY, solenoid: 1 pole normally open, 3 poles normally closed; 10 amp, noninductive load at 600 v a-c; silver cont; 3-5/8" lg x 3-1/8" wd x x 3-1/8" h o/a; AB type B-130, Bul. 700.	Nonautomatic restart timer auxiliary.	2Z7593-178
K314, K317	RELAY, thermal: normally open; 3 amp 150 v d-c, 3 amp 250 v a-c; silver cont; 1.275" dia max x 3-1/4" lg excluding term.; 20 sec ±3 sec at nom 117 v a-c; Edison type 501, cat. #B-2003.	K314: Timer for regulator motor. K317: Timer for regulator motor.	2Z7598-184
K322	RELAY, thermal: Navy type #-291782; SPST, one normally closed; 6 amp; 250 v a-c; 1-1/4" dia x 3-1/4" lg excluding term.; Edison model 501.	Thermal timer for keying shut-down.	2Z7598-185
R346, R352	RESISTOR, fixed: comp; JAN RC42BF220K; 22 ohms ±10%; 2 w.	R346: K326 relay shunt. R352: K307 relay shunt.	3RC42BF220K
R353, R354	RESISTOR, fixed: comp; JAN type RC42BF471K; 470 ohms ±10%; 2 w.	R353: Meter light series. R354: Meter light series.	3RC42BF471K
R335, R336, R337, R338, R339, R340, R341, R342, R357, R358	RESISTOR, fixed: comp; JAN type RC30BF184K; .18 meg ±10%; 1 w.	R335: I 311 voltage dropping. R336: I 312 voltage dropping. R337: I 313 voltage dropping. R338: I 314 voltage dropping. R339: I 315 voltage dropping. R340: I 316 voltage dropping. R341: I 317 voltage dropping. R342: I 318 voltage dropping. R357: I 308 voltage dropping. R358: I 309 voltage dropping.	3RC30BF184K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R332	RESISTOR, fixed; JAN type RW12G5R0; 5 ohms ±5%; 86 w at 275° C max continuous oper temp; 7-7/16" lg x 1-5/16" dia o/a; 2 ferrule term. 1-1/8" dia x 1/2" lg.	Automatic keying shut-down timer (K322) shunt.	3RW10532
R349	RESISTOR, fixed: JAN type RW33F8R0, 8 ohms ±5%; 18 w at max continuous oper temp 275° C; 3" lg x 19/32" dia max; 2 radial tab term. 21/64" lg x 11/64" to 21/64" wd x .016" min thk.	K322 relay shunt.	3RW11708
R347, R348, R350, R351	RESISTOR, fixed: WW; JAN type #RW55G100; 10 ohms ±5%; 5 w at 275° C max continuous oper temp; 1-3/8" lg x 5/8" max dia; two 2-1/2" lg axial wire lead term.	R347: K324 relay shunt. R348: K325 relay shunt. R350, R351: K319 relay shunt.	3RW12331
R308, R309	RESISTOR, fixed: Navy type #-637312-20; WW; 21 ohms ±20%; power rating 5.8 amp continuous; 15-1/8" lg x 2-1/16" wd x 2-21/32" h excluding term.; two #10-32 NC-2 screw term.; two 5/16" -18 NC-2 x 1-5/32" lg mtg studs; GE cat. #CR9033B5D17.	R308, R309: Power amplifier plate surge limiting.	3Z6002A1-19
R301, R303, R304, R305, R306, R323, R333	RESISTOR, fixed: WW; JAN type RW11F251; 250 ohms ±5%; 116 w at 275° C max continuous oper temp; 9-5/8" lg x 1-5/16" dia o/a; 2 ferrule term. 1-1/8" dia x 1/2" lg.	R301: Power amplifier divider. R303, R304: Power amplifier bias divider. R305, R306, R333: H-v filter reactor shunt. R323: H-v bleeder.	3RW20701
R343, R344	RESISTOR, fixed: WW; JAN type RW11F501; 500 ohms ±5%; 116 w at 275° C max continuous oper temp; 8-5/8" lg x 1-5/16" dia o/a less term.; 2 ferrule term. 1-1/8" dia x 1/2" lg.	R343, R344: Bias bleeders.	3RW22515
R312 thru R317	RESISTOR, fixed: WW; JAN type RW10G801; 800 ohms ±5%; 140 w at 275° max continuous oper temp; 11-7/16" lg x 1-5/16" dia o/a; 2 ferrule term. 1-1/8" dia x 1/2" lg.	R312 thru R317: H-v bleeders.	
R345	RESISTOR, fixed: JAN type RW14G162; 1,600 ohms ±5%; 40 w at 275° C max continuous oper temp; 3-7/16" lg x 1" dia less term.; 2 ferrule term. 13/16" dia x 1/2" lg.	K315B voltage bleeding.	
R328, R329, R330, R331, R334	RESISTOR, fixed: WW; JAN type RW16G312; 3,100 ohms ±5%; 14 w at 275° C max continuous oper temp; 1-3/8" lg x 3/4" dia less term. 2 ferrule term. 9/16" dia x 1/2" lg.	R328: I 303 voltage dropping. R329: I 304 voltage dropping. R330: I 305 voltage dropping. R331: I 309 voltage dropping. R334: I 306 voltage dropping.	3RW27352

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R324	RESISTOR, fixed: WW; JAN type RW13F103; 10,000 ohms ±5%; 50 w at 275° C max continuous oper temp; 4-7/16" lg x 1" dia o/a; 2 ferrule term. 13/16" dia x 1/2" lg.	L-v bleeder.	3RW30303
R318 thru R322	RESISTOR, fixed: JAN RW10G123; 12,000 ohms ±5%; 140 w at 275° C max continuous oper temp; 10-7/16" lg x 1-5/16" dia o/a; 2 ferrule term. 1-1/8" dia x 1/2" lg.	R318 thru R322: H-v bleeders.	
R311	RESISTOR, fixed: JAN type RW14F163; 16,000 ohms ±5%; 40 w at 275° C max continuous oper temp; 4-7/16" lg x 1" dia o/a; 2 ferrule term. 13/16" dia x 1/2" lg.	Plate voltmeter shunt.	3RW31516
R307, R310	RESISTOR, fixed: WW; JAN type #MFA 405; 4.0 meg ±5%; 85° C continuous oper temp; 8-11/16" lg x 1-13/32" dia o/a; 2 ferrule term. 1-9/17" dia x 33/64" lg.	R307, R310: Plate voltmeter multipliers.	3RM400-1
R326, R327	RESISTOR, variable: WW; JAN type RP301FD-100KK; 10 ohms ±10%; 150 w, at 390° C continuous oper temp, 3.87" amp max; 3 solder lug term.	Power amplifier filament rheostats.	3RP3311
R356	RESISTOR, variable: WW; JAN type #RA20A2SA-101AK; 100 ohms ±10%; 2 w at 100° C max continuous oper temp; 3 solder lug term.	Regulator sensitivity.	3RA3608
R302	RESISTOR, variable: WW; JAN type RP301FE-251KK; 250 ohms ±10%; 150 w, at 390° C continuous oper temp; .07 amp max; 3 solder lug term.	Power amplifier bias divider.	3RP6310
R355	RESISTOR, variable: WW; JAN type #RA20A2SA-103AK; 10,000 ohms ±10%; 2 w at 100° C max continuous oper temp; 3 solder lug term.	Adjusts regulator voltage.	3RA7515
XV301 XV302 XV303 XV304 XV305 XV306	SOCKET, tube: Navy type #-49424; 4 prong bayonet lock socket for use w/50 w base tubes; above chassis base mtg; Johnson EF cat. #211.	XV301: Mounts V301. XV302: Mounts V302. XV303: Mounts V303. XV304: Mounts V304. XV305: Mounts, V305. XV306: Mounts V306.	2Z8759.3
XV307 XV308 XV309 XV310	SOCKET, tube: Navy type #-49345; 4 prong med; Johnson EF cat. #209.	XV307: Mounts V307. XV308: Mounts V308. XV309: Mounts V309. XV310: Mounts V310.	2Z8759.4-1
XK322 XV314 XV317	SOCKET, tube: Navy type #-491479-A; octal; above chassis fl mtg; Amphenol type 88-8T.	Mounts K322.	2ZK8795-24
E316, E317	STUD: brass, cad pl; 1-1/2" lg; 1/4"-20 NC-2 thd entire length; Collins Rad part/dwg #312 0261 00.	Ground stud for Power Supply Assembly PP-1088/FRT-26.	
S316	SWITCH, lever: Navy type #-241425; 2 position nonlocking; 10 amp 110 v a-c noninductive; 3-	Test key.	3Z9580-30.31

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	29/32" lg x 1-1/4" wd x 1-3/4" h excluding handle; lever type handle 1-8/16" lg x 1/2" dia; Mossman DP type 4101.		
S308	SWITCH, push: Navy type #-241428; 40 amp 110 v, 20 amp 220 v, 13 amp 440 v; 3-9/16" lg x 2" wd x 1-3/4" h o/a; normally closed; Collins Rad part/dwg #260 0352 00.	H-v off.	3Z9824-50.17
S309	SWITCH, push: Navy type #-241429; 40 amp 110 v, 20 amp 220 v, 13 amp 440 v; 3-9/16" lg x 2" wd x 1-3/4" h o/a; normally open; Collins Rad part/dwg #260 0355 00.	H-v on	3Z9824-50.16
S318 ABC S319 ABC S322, S322 ABC S323, S323 ABC	SWITCH, push: Navy type #-241443; three cont normally closed by shorting disc; brass frame; 7-3/16" lg x 3-1/2" wd x 4" h o/a; momentary; four solder term; four 10-32 NF-2 mtg holes on 4-1/8" x 2-3/8" mtg/c, 8" lg shaft; Collins Rad part/dwg #503 1938 003.	S318ABC: Door operated grounding switch, gnds secd wnd of T401. S319ABC: Door operated grounding switch, gnds secd wnd of T401. S322: Door operated grounding switch. S322A: Gnd HV line. S322B: Gnds Bias line. S322C: Gnds LV line. S323: Door operated grounding switch. S323A: Gnds HV line. S323B: Gnds bias line. S323C: Gnds LV line.	
S311A, S312A S313A	SWITCH, push-pull: Navy type #-24067; male cont; bakelite body; 1-7/8" lg x 11/16" wd x 5/8" h o/a; momentary action; screw term; 2 mtg holes 5/32" diam on 1-1/4" mtg/c; Collins Rad part/dwg #260 4040 00.	p/o door interlock S311. p/o door interlock S312. p/o door interlock S313.	
S311B, S312B, S313B	SWITCH, push-pull: Navy type #-24067; 2 female cont; 2-5/16" lg x 15/16" wd x 5/8" d; momentary action; GE #7460330-G4.	S311B: Part of door interlock S311. S312B: Part of door interlock S312. S313B: Part of door interlock S313.	3Z9560-7
S310 AB	SWITCH, rotary: 3 pole 3 position; 7-1/2 amp at 115 v, 60 cyc; solid silver cont; steatite stator and rotor; 2-13/16" lg x 1-7/8" wd x 1-7/16" h o/a; Collins Rad part/dwg #259 0127 00.	Tune-operate.	3Z9825-92.11
S314 ABCD	SWITCH, rotary: 6 pole 5 position; 2 decks; 7-1/2 amp at 115 v, 60 cyc; solid silver cont; steatite stator and rotor; 2-1/16" lg x 2-1/16" wd x 2-9/16" h o/a; nonshorting cont; Collins Rad part/dwg #259 0313 00.	Meter switch for M303.	3Z9825-58.204

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
S317	SWITCH, rotary: 1 pole 10 position; silver pl brass cont; steatite ceramic stator and rotor; 1-7/8" lg x 1-17/32" wd x 1-7/16" h o/a: Collins Rad part/dwg #259 0305 00.	Reclosure cycle selector.	3Z9825-92.12
S307	SWITCH, toggle: Navy type #-251426 DPST; 30 amp, 250 v; 5 amp, 600 v; 3-11/16" lg x 1-25/32" wd x 1-27/32" d excluding lever; Trumbull type 2228S.	Filament on-off and emergency shut-down.	3Z9858-3.4
S324	SWITCH, toggle: SPST; JAN type ST42A; 125 v a-c 15 amp .75 amp d-c, 250 v a-c 6 amp, .5 amp d-c, 30 v d-c 20 amp locking, 15 amp momentary; 1-1/16" lg x 41/64" wd x 1-9/64" h max o/a.	Automatic shut-down on-off.	3Z9863-42A
T301, T302, T303, T304, T305, T306	TRANSFORMER, power: step-down; Navy type #-304891; filament type; input 240 v, tapped to operate at 230 v, 220 v 50/60 cps, single ph; one output wnd; secd 5 v at 10 amp ct; pri 2500 v test, secd 15,000 v test; 4.780" lg x 5.310" wd x 6.050" h excluding term. and mtg fl; Chi Trans type #12635.	T301 thru T306: H-v rectifier filaments.	2Z9600.162
T307, T308	TRANSFORMER, power: step-down; Navy type #-304886; filament type; input tapped at 230 v, 220 v, 240 v, 50/60 cps, single ph; one output wnd; secd 2.5 v at 10 amp ct; pri 2,500 v, secd 10,000 v ins; 4-7/64" lg x 4.560" wd x 5-5/16" h excluding term. and mtg fl; Chi Trans type #9753.	T307: L-v rectifier filament. T308: Bias rectifier filament.	2Z9600.159
T309	TRANSFORMER, power: step-up; Navy type #-304889; plate type; input 230 v, tapped at 208 v, 50/60 cps, single ph; secd 1.410 v at 0-368 amp ct; pri 3,500 v test, secd 3,000 v test; 6-1/8" lg x 7.050" wd x 8-3/32" h excluding term, and mtg fl; Chi Trans type #9940.	L-v plate.	2Z9601.91
T310	TRANSFORMER, power: step-up; Navy type #-304890; plate type; input 230 v, tapped at 208 v, 50/60 cps single ph; one output wnd; secd 940 v at .530 amp ct; 2,500 v test; 6.13" lg x 7.05" wd x 8.08" h excluding term. and mtg fl; Chi Trans type #12634.	Bias supply.	2Z9601.92
T311, T312, T313	TRANSFORMER, power: step-down; filament type; input 75 v a-c, 50/60 cps; single output wnd; secd 21 v a-c, to amp max, 1.05 kva; 1,200 v test; Collins Rad part/dwg #664 0083 00.	T311 thru T313: Line voltage buck boosts.	2Z9621B-76
T314, T315	TRANSFORMER, power: step-down; filament type; input 230 v, 50/60 cps; single output wnd; secd 115 v at .43 amp; 1,500 v test; GE #71G319 mod.	T314: Regulating control. T315: Regulating motor.	2Z9621B-77
V301, V302, V303, V304, V305, V306	TUBE, electron: type 4B32.	V301 thru V306: H-v rectifiers.	2J4B32

2. Identification Table of Parts for Power Supply Assembly PP-1088/FRT-26 (contd)

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
V307, V308, V309, V310	TUBE, electron: type 3B28.	V307, V308: L-v rectifiers. V309, V310: Bias rectifiers.	2J3B28
M302	VOLTMETER: a-c, 25 to 125 cps; range 0 to 300 v; rectangular, flush, black bakelite case; 2-3/4" x 2-7/8" body, 1.46" d, behind fl, 3" x 3-1/8" x 3/16" fl; 2% accuracy for full-scale reading; 50,000 ohm int resistance, .84 va at 25 or 60 cyc; calibrated for 3/32" thk steel panel; Weston model 734.	Primary a-c voltmeter.	3F8300-64
M303	VOLTMETER: a-c, 25 to 125 cps; range 0 to 10 v; rectangular, flush, black bakelite case; 2-3/4" x 2-7/8" body, 1.46" d, behind fl, 3" x 3-1/8" x 3/16" fl; 2% accuracy for full-scale reading; 140-ohm resistance, .84 va at 25 or 60 cyc; calibrated for 3/32" thk steel panel; Weston model 734.	Power amplifier filament voltmeter.	3F8010-31

3. Identification Table of Parts for Power Transformer TF-196/FRT-26 and Power Supply Control C-1402/FRT-26

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
T401	POWER TRANSFORMER TF-196/FRT-26: input 215-245 v a-c, 50-60 cyc, 3 phase; 3 output wnd, 2575 v rms approx ea phase, 4 amp per phase, taps at 90% of ea wnd; air cooled; 40-1/2" lg, 19-1/8" wd, 31-3/4" h o/a; Wemco 11-C-1073.	High voltage plate.	2Z9618-134
401 499 series	POWER SUPPLY CONTROL C-1402/FRT-26: 30-1/4" lg x 14-1/4" wd x 38-1/4" h o/a dim; Collins Rad.	Remote control from front of transmitter.	3H1099-587
K401C, K1701C	BRUSH SET, electrical cont: rectangular, 11/16" lg x .279" wd x .216" thk, shunt 1" lg, ea brush; Collins Rad part/dwg #260 0788 00.	K401C: Brush for motor K401B. K1701C: Brush for motor K1701B.	3H525F3
K401	CIRCUIT BREAKER: Navy type #-291788; thermal-magnetic; 3 pole; 250 v a-c, 125 to 250 v a-c, 125 amp at 25° C; metal case; 15-19/32" lg x 14-5/8" wd x 8-1/4" d o/a; Wemco catalog #1310-872.	H-v primary start-stop contactor and breaker, motor operated.	3H900-125-1
F401, F402, F1701, F1702	FUSE, cartridge: 10 amp, blowing time, life at 110%, 1 hr at 135%, 5 to 60 S at 200% load; 250 v; one time; 2" lg x 9/16" dia o/a; Buss 10,25010.	F401, F402: High voltage on lamp. F1701, F1702: HV ON lamp fuse.	3Z2610.2

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
F403, F404, F405	FUSE, cartridge: Navy type #-28079-50; 50 amp, blowing time, life at 110%, 1 hr at 135%, 5 to 50 sec at 200% load; 250 v; one time; 3" lg x 13/16" dia o/a; Bussman 9F50 Collins Rad part/dwg #264 0054 00.	F403: Primary wiring to transformer primary. F404, F405: Primary wiring to transformer inclosure.	3Z2650.7
XF401, XF402	FUSEHOLDER: block type; for two 9/16" dia x 1-1/2" lg cartridge fuses; 250v, 30 amp; 3-3/4" lg x 2-3/4" wd x 1-3/8" h o/a; Collins Rad part/dwg #265 5020 00.	Single socket mounts F401 and F402.	3Z2831-6.1
XF403, XF404, XF405	FUSEHOLDER: block type; for three 13/16" dia x 1-1/2" lg cartridge fuses; 250 v, 1 to 15 amp; 4-13/16" lg x 4-3/4" wd x 1-3/4" h o/a; Collins Rad part/dwg #265 6030 00	Single socket mounts F403 to F405 inclusive.	3Z3282-56.1
XI 401A	GLOBE, electric light: glass body; for use w/ 10-60 w lamp; cylindrical shape; 4-1/2" dia x 6-3/8" h o/a; Collins Rad part/dwg #262 0082 00.	XI 401A: Part of indicator light XI 401.	6Z4770-9
R401 thru R406	HEATING ELEMENT, electrical: Navy type #-637317; fin type; 73.5 v, 1500 w; single sect; 23-3/4" lg x 2" wd x 1-3/8" thk o/a; Wiegand type SE F-24.	Primary line series dropping resistors for tuning.	6Z5054-27
I 401	LAMP, incandescent; 240 v, 50 w; 3-15/16" lg o/a; Collins Rad part/dwg #262 0075 00.	External HV on lamp	6Z6840-50
XI 401, XI 402	LAMPHOLDER: w/o lens; medium screw base for 10 to 60 w lamp; 4-9/16" lg x 4-9/16" wd x 11/16" h o/a; Pyle-National catalog #BOUZ-15-S.	XI 401: Mounts I 401. XI 402: Mounts I 402.	2Z5991-381
K402	RELAY, armature: Navy type #-291780; 3 pole, one normally open; 100 amp noninductive load at 600 v; single wnd, 220 v, 60 cps, 11-7/8" lg x 6-7/8" wd x 5-5/8" h o/a; fast acting; Collins Rad part/dwg #405 0208 00.	Tune resistor shorting.	2Z7593-179
K402 (Alt)	RELAY, armature: 3 poles, one normally open; cont rating 100 amp noninductive load at 600 v; single wnd, oper voltage 220 v, 50 cps; 11-7/8" lg x 6-7/8" wd x 5-5/8" h o/a; Collins Rad part/dwg #405 0226 00.	Tune resistor shorting.	2Z7593-180
S401	SWITCH, rotary: 8 pole 4 position; 8 decks; 100 amp, 500 v a-c; 19 silver pl brass cont; 12" lg x 6-3/4" wd x 6-3/4" h o/a; four 1/4"-20 NC-2 dia mtg holes on 2.000" x 3.500" mtg/c; Collins Rad part/dwg #503 8484 003.	Delta-wye switch.	3Z9825-92.13

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
501-599, 601-699, 701-799, 801-899, 1201-1299, 1301-1399 series.	RADIO TRANSMITTER T-454/FRT-26: electrical ratings, 4.0 to 26.0 mc freq range, 600 ohm output impedance; controls, filament on-off; (push actuated) RA-B plus on-off switch, emergency off exciter test switch, keying input level control, keying selector, r-f excitation control, PA test switch test key, 1st multiplier plate tuning, also 2nd, driver plate tuning, r-f amplifier plate tuning, power amplifier loading control, antenna tuning; a-c 230 v, 50-60 cycles, 3 ph, 35 kw; variable tuning; Sig C Radio Transmitter T-454/FRT-26; MIL-R-11181 (Sig C); Collins Rad, for A1 emission.	For A 1 emission.	2C6900-225
Z501 thru Z506	AMPLIFIER, a-f: servo; 12-1/4" lg x 4-7/16" wd x 2-5/8" h o/a; input 100 v, 50/60 cps, single ph; 1 input channel; output impedance 18,000 ohms plate to plate; metal chassis; Collins Rad part/dwg #505 6610 004.	Z501: V502 tuning. Z502: V503 tuning. Z503: V504 tuning. Z504: Power amplifier plate tuning. Z505: Output coupling adjustment. Z506: Antenna output coupling tuning.	2C311-1
O561, O708	ARM: actuator; SS type #303; 3-9/16" lg x .500" wd x 11/32" h o/a; single .253" dia mtg hole on one end; Collins Rad part/dwg #505 8056 002.	O561: Operates S522 and S523. O708: Operates limit switches.	
L518A, L519A	BAR, shorting: used to vary the inductance of coils; silver pl brass; 8" lg x 11/16" wd x 11/16" h o/a; 4 holes 4-40 NC-2 x 1/4 d, .312" c to c on top and bottom; 4 holes 4-40 NC-2 x 1/4" d, .281" c to c on opposite sides; one 3/16" dia hole through bar from side; Collins Rad part/dwg #504 1951 003.	L518A: Part of left antenna coupling coil. L519A: Part of right antenna coupling coil.	2Z558-90
O531	BEARING, ball: double row radial; two shields; light duty; .3937" bore, 1.1811" OD, 9/16" wd; 18 balls; packed with AN-G-25 grease; std fit; ABEC-1 std tol; ND#55500X1E.	Bearing in Power amplifier drive assembly.	
O706, O707	BEARING, ball: single row radial; shielded w/2 retainer plates; extra light duty; .2500" bore, .6250" OD, .1970" wd; 7 balls; lubricated w/WS-429, std fit; ABEC-1 std tol; ND type 77H catalog #77R-4.	Supports output shaft.	
B501A	BELT, V: comp; .3" wd inside, .5" wd outside, 9/32" thk, 27" lg inside, 29" lg outside; 5 cord single row; Browning #FHP127; Collins Rad part/dwg #233 0030 00; 60 cyc.	Motor to blower impeller.	3H340-288
B501A (Alt)	BELT, V: comp; .3" wd inside, .5" wd outside, 9/32" thk, 28" lg inside, 30" lg outside; 5 cord single row; Browning type FHP; Collins Rad part/dwg #233 0026 00; 50 cyc.	Motor to blower impeller.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
B501	BLOWER: centrifugal vane; elec motor operated; 48 steel blades; nonportable; unguarded; motor 3/4 hp, 50/60 cps, 3 ph, 220/440 v a-c; 24-7/16" lg x 16-3/8" wd x 22" h o/a; adj intake; single speed, 1600 rpm; V belt drive; 1/2" wd pulley; counter-clockwise up-blast, outlet 10-1/8" x 7-1/8" on top; steel housing, painted surface; mtd by four vibration dampener mts w/2 7/16" dia holes in ea spaced on 14-1/4" x 8-3/8" mtg/c; inc. term. strip and SPDT sensitive switch; Collins Rad part/dwg #505 5427 004.	Circulates cooling air through r-f unit cabinet.	3H388-102
B501 (Alt)	BLOWER: centrifugal vane; electric motor operated; 9" dia wheel, 48 steel blades; nonportable; motor 3/4 hp, 50/60 cps 3 phase, 220 v a-c; unguarded; 24" lg x 16-1/8" wd x 22-7/8" h o/a; adj intake; single speed, 1550 rpm; belt drive; 2" wd pulley; counter-clockwise up-blast, outlet 8-7/8" x 7-1/4" on top; steel housing painted; four mounts w/two 21/64" dia holes in ea on 12-3/4" x 11" mtg/c; incl term strip and SPDT sensitive switch; Collins Rad part/dwg #503 9480 004.	Circulates cooling air through r-f unit cabinet.	
O563	CAM: anodized aluminum; 1" rad x 1/2" thk; single tapped mtg hole #6-40 NF-2 ctb .187" dia x 5/8" d at 90 deg angle; Collins Rad part/dwg #506 5957 002.	Operates shorting contact E647.	
Z512	CABINET: for mtg and enclosing six Servo amplifiers; aluminum chassis; empty; 17" lg x 5-1/8" wd x 14-1/2" h approx o/a; interior includes six 10 term sockets, two term blocks, two term strip pads, two base support blocks; handle on top, inside hinged cover; Collins Rad part/dwg #505 6606 004.	Mount chassis.	
W502	CABLE ASSEMBLY, special purpose: c/o eleven #18 AWG cond; 10 ft. lg o/a; 1 end terminated w/ Cannonelec #DPD-45-33S-1 plug, other end terminated w/Cannonelec #DPD-45-34P plug; incl cover and adapter flange; Collins Rad part/dwg #506 7094 005.	Cable from cabinet to lower front door.	3E4002.138
W503	CABLE ASSEMBLY, special purpose: c/o six #18 AWG cond; 6 ft. lg excluding terminations; 1 end terminated w/AN3106A-16S-1S plug and AN3057-8 cable clamp other end terminated w/solder lugs; Collins Rad part/dwg #506 5973 003.	Cable from intermediate power amplifier antenna shorting switch to cabinet.	3H4002.139
C501	CAPACITOR, fixed: ceramic dielectric; JAN type #CC20CH100D; 10 uuf ±1/2 uuf; 500 vdcw.	Couples J503 to grid of V501.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C503, C504, C506, C508, C509, C513, C514, C515	CAPACITOR, fixed: mica; dielectric; 10,000 ohms ±20%; 20 vdcw; JAN type CM45B103M.	Tuning afc motor field.	3K4510324
C521, C532	CAPACITOR, fixed: Navy type #-481689-10; ceramic dielectric; 25 uuf ±10%; 2500 vdcw RMS at 2 mc, 1000 vdcw rms at 16 mc; 51/64" dia x 5/8" lg case; 2 axial 6-32 tapped holes; Centralab type 850.	C521: Power amplifier balance. C532: Power amplifier grid balance.	3D9025-53
C539, C540	CAPACITOR, fixed: ceramic dielectric; 63 uuf ±2%; 5000 vdcw; 51/64" dia x 5/8" lg case; two axial 6-32 tapped holes; term. mtg; uninsulated; Centralab #850-019.	C539: V506 parasite trap (used with E523). C540: V505 parasite trap (used with E524).	
C1310	CAPACITOR, fixed: ceramic dielectric; 100 uuf ±10%; 5000 vdcw; 51/64" dia x 7/8" lg; axial hex. nut term.; tapped hole 6-32 NC-2 x 3/16" d ea end; uninsulated; Centralab #850 A.	Part of low-pass filament.	
C518, C520, C522, C523, C525, C543 thru C550, C555 thru C558, C563 thru C566	CAPACITOR, fixed: ceramic dielectric; 1000 uuf ±20%; 5000 vdcw; 51/64" dia x .625" lg case less term; axial screw style term; uninsulated; Centralab #858.	C518: Coupling V503 to V504. C520, C525: V504 screen bypass. C522, C523: V504 filament bypass. C543 thru C546 and C555 thru C558: V505 filament bypass. C547 thru C550: V506 filament bypass. C563 thru C566: V506 filament bypass.	3DA1-299
C512	CAPACITOR, fixed: mica; JAN type #CM45B101M; 100 uuf ±20%; 2500 vdcw.	Coupling V502 to V503.	3K4570124
C507	CAPACITOR, fixed: mica; JAN type #CM5B221M; 220 uuf ±20%; 2500 vdcw.	Coupling V501 to V502.	3K4522124
C510, C516	CAPACITOR, fixed: mica; JAN type #CM45B222M; 2200 uuf ±20%; 1200 vdcw.	C510: Coupling V502 to V503. C516: Coupling V503 to V504.	3K4522224
C579	CAPACITOR, fixed: mica; JAN type #CM35B472M; 4700 uuf ±20%; 500 vdcw.	Grid V507 limit high frequency response.	3K3547224
C1603, C1604	CAPACITOR, fixed: paper dielectric; 15 uf ±10%, 1000 vdcw; JAN type CP70E1FG156K.	C1603: Bias filter. C1604: Bias filter.	3DB15-41

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C1601, C1602, C1608, C1609	CAPACITOR, fixed: paper dielectric; 2 uf ±10%, 7500 vdcw; JAN type CP70D1FR205K.	H-v filters.	3DB2-269
C1605, C1606, C1607	CAPACITOR, fixed: mica dielectric; 4700 uuf ±20%, 2500 vdcw; JAN type CM50B472M.	C1605: M1601 bypass. C1606: M1602 bypass. C1607: M1603 bypass.	3K5047224
C536, C537	CAPACITOR, fixed: mica; JAN type #CM60B103K; 10,000 uuf ±10%; 2500 vdcw.	R-f bypass in power amplifier test metering circuit.	3K6010321
C505, C589	CAPACITOR, fixed: paper dielectric JAN type #CP50B1FF104X; 100,000 uuf +40% -15%; 600 vdcw.	Keying wave shaper in output load of V507.	3DA100-1051
C803, C804	CAPACITOR, fixed: paper dielectric; JAN type #CP54B1FF254K; 250,000 uuf ±10%; 600 vdcw.	C803: K801 spark suppressor. C804: K802 spark suppressor.	3DA250-372
C805	CAPACITOR, fixed: paper dielectric; JAN type #CP53B1FF504X; 500,000 uuf +40% -15%; 600 vdcw.	Feedback phasing.	3DA500-772
C585, C588, C590, C704, C705	CAPACITOR, fixed: paper dielectric: JAN type #CP61B1DE105V; 2 sect.; 1 uf +20% -10% per sect.; 400 vdcw.	C585: K506 spark suppressor. C588: Spark suppressor. C590: Arc suppression. C704: Arc suppression. C705: Arc suppression.	3DB1-460
C801, C802	CAPACITOR, fixed: paper dielectric; JAN type #CP61B1FF105V; 1 uf +20% -10%; 600 vdcw.	C801: K801 coil shunt. C802: K802 coil shunt.	3DB1-280
C586	CAPACITOR, fixed: paper dielectric; 2 uf p/m 10%; 400 vdcw; HS metal case; 2-1/4" lg x 1-3/16" wd x 1-3/16" h; impr w/mineral oil; two solder lug term located on side; no int gnd connections; accom mtg bkt; Sangamo type #62A.	Filter for K503.	
C552, C701	CAPACITOR, fixed: Navy type #484967-10; paper dielectric; 4 uf ±10%; 230 vacw; HS metal case; 2-1/2" wd x 1-3/16" d x 2-7/8" h excl term; oil impr; two solder lug term. located on top, spaced 1-1/8" c to c; Solar type ALXC2.3-4.0.	C552: Phase splitting for servo drive motor B502. C701: Phase splitting for servo drive motors.	3DB4-367
C583	CAPACITOR, fixed: paper dielectric; JAN type #CP40C2FF405V; 4 uf +20% -10%; 600 vdcw.	Filter in grid of V104.	3DB4-303

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C702, C703	CAPACITOR, fixed: paper dielectric; single sect; 4.0 uf p/m 20%; 600 vdcw, 330 vacw; HS metal case finished in Collins gray, 2-1/2" lg x 1-3/16" wd x 2-1/2" h less term and mtg; oil impr; two solder lug term on top of case spaced 1-1/2" c to c; no int gnd connections; mtg plate w/two 7/32" lg x 5/32" wd slots spaced 2-3/4" c to c; special case marked w/mfr number, Collins part number, capacity value and working v; Collins Rad part/dwg #930 6214 00.	Phase splitting for motor B703.	
C1301, C1305	CAPACITOR, fixed: Navy type #-484978-10; vacuum dielectric; 6 uuf ±10%; 20,000 v r-f peak; 4-3/16" lg x 2-1/4" dia o/a in sealed glass envelope; one ferrule term. on ea end; term. mtg.	C1301: Coupling plate J1301. C1305: Coupling plate V1303.	3D9006-39
C527 thru C531	CAPACITOR, fixed: Navy type #-484980-10; vacuum dielectric; 140 uuf ±10%; 20,000 v r-f peak; 4-1/2" lg x 3" dia o/a in sealed glass envelope; one ferrule term. ea end; term mtg; Jennings Rad type WX; Collins Rad part/dwg #919 0050 00.	C527 thru C529: V505 grid. C530, C531: Power amplifier grid.	3D9140-6
C567, C568	CAPACITOR, fixed: Navy type #-484977-10; vacuum dielectric; 250 uuf ±10%; 20,000 v r-f peak; 6-1/2" lg x 2-11/16" dia o/a in sealed glass envelope; one ferrule term. on ea end; term. mtg; Jennings Rad type VC; Collins Rad part/dwg #919 0032 00.	D-c blocking plate tank V505 and V506.	3D9250-117
C551	CAPACITOR, fixed: mica dielectric; 10,000 uuf ±20%; 300 vdcw; JAN type CM35B103M.	V507 filament bypass.	3K3510324
C502	CAPACITOR, fixed: mica dielectric; 1000 uuf ±20%; 500 vdcw; JAN type CM30B102M.	Coupling J504 to V501.	3K3010224
C584	CAPACITOR, fixed: ceramic dielectric; 3 uuf ±1/2 uuf; 500 vdcw; Collins part/dwg #916 0145 00.	Grid V504 suppressor circuit.	
C524, C538, C575, C576, C577	CAPACITOR, fixed: mica dielectric; 4700 uuf ±20%; 2500 vdcw; JAN type CM50B472M.	C524: V504 cathode meter bypass. C538: V505 and V506 cathode meter bypass. C575: Power amplifier multimeter bypass. C576: Exciter multimeter M505 bypass. C577: Exciter multimeter M506 bypass.	3K5047224
C580, C581, C582	CAPACITOR, fixed: paper dielectric; 15 uf ±10%; 1000 vdcw; JAN type CP70E1FG156K.	Filter in plate supply V507.	3DB15-41
C573, C574	CAPACITOR, variable: Navy type #-484971; air dielectric; plate meshing type; 9 to 52 uuf; SLC characteristic; air gap .075"; 3-1/16" lg x 2-1/16"	Grid tuning for single sideband suppress carrier.	3D9052V-6

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	wd x 2" h excluding shaft, shaft .249" dia x 1-1/2" lg on one end and 5/8" lg on other end; scdr adj one end; lug term.; Johnson EF catalog #50F30.		
C535	CAPACITOR, variable: Navy type #-484970; air dielectric; plate meshing type; 11 to 67 uuf; 3-15/32" lg x 2-1/16" wd x 2" h excl shaft, shaft 1/4" dia x 1-1/4" lg; scdr adj; lug term; two .140" dia mtg holes in base 3-5/32" c to c; Johnson EF catalog #70F30.	Power amplifier grid drive balance.	3D9067V-4
C511, C517	CAPACITOR, variable: Navy type #-484972; air dielectric; plate meshing type; 12 to 154 uuf; 3-15/32" lg x 2-1/16" wd x 2" h excluding shaft, shaft .249" dia x 1-1/2" lg; scdr adj; lug term.; two .140" dia mtg holes in base 3-5/16" c to c; Johnson EF catalog #150F20.	C511: Plate tuning V502. C517: Plate tuning V503.	3D9156V
C533, C534	CAPACITOR, variable: Navy type #-484973; air dielectric; plate meshing type; 25 to 347 uuf; 7-1/4" lg x 2-5/8" wd x 2-19/32" h excluding shaft, shaft 1/4" dia x 1-1/2" lg on one end and 5/8" lg on other end; scdr adj on one end; lug term.; two .140" dia mtg holes in base 6-7/8" c to c; Johnson EF catalog #350E30.	V504 loading.	3D9347V
C1309	CAPACITOR, variable: air dielectric; plate meshing type; 7.3 to 51.1 uuf; 1-51/64" lg x 15/16" wd x 1-7/32" h, shaft 5/16" lg; scdr adj; 360 deg rotation; solder lug term.; two #4-40 NC-2 tapped mtg holes spaced 21/32" c to c; Collins Rad part/dwg #922 0246 00.	Part of low-pass filament.	3D9051VE1
C541, C542	CAPACITOR, variable: Navy type #-484986; vacuum dielectric; 20 to 35 uuf ±20%, 15 amp max; 20,000 v test; shaft tuning, shaft 1/4" dia x 1/4" lg; 6-1/2" lg x 3" dia o/a; in sealed glass envelope; ferrule term on ea end; clamp mtg; Jennings Rad type ATC; Collins Rad part/dwg #919 0078 00.	C541: V505 neutralizing. C542: V506 neutralizing.	3D9035V-56
C526A, C569A, C570A, C571A, C572A	CAPACITOR, variable: vacuum dielectric; single sect.; 25 to 500 uuf; 15,000 v peak; copper anode; 5" dia x 11-5/16" lg o/a; in sealed glass envelope; clamp mtd; Jennings Rad type UXC.	C526A: Part of C526; for economy of maintenance. C569A: Part of C569; for economy of maintenance. C570A: Part of C570; for economy of maintenance. C571A: Part of C571; for economy of maintenance C572A: Part of C572; for economy of maintenance.	3D9500V-9

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
O511	CHAIN: 3/16" pitch, silent type Link-Belt S-1807; SS; 3.1 ft. lg, 96 links, 192 pitches; lock construction for bushing and pin; ends riveted together; Collins part/dwg #503 9106 002.	Drive chain for antenna platform drive assembly.	
O519	CHAIN: link, silent duplex, Link-Belt type D-1810 3/16" pitch; cad plated steel; 5.6 ft. lg, 354 pitches 5/16" wd; lock construction for bushing and pin; includes coupler link and pin; Link-Belt type D-1810.	Power amplifier plate tuning drive chain.	
XV-505C, XV-506C	CLIP: plate; silver pl beryllium copper; 4.656" lg x 1-3/16" wd x .008" thk o/a; 17 fingers equally spaced; Collins Rad part/dwg #503 8952 002.	XV505C: Part of tube socket XV505. XV506C: Part of tube socket XV506.	2Z2712.193
E624, E629, E1409	CLIP: electron tube; for connecting to plate term. beryllium copper, tinned, RSW; 1-1/8" lg x 5/8" wd x 19/32" h o/a; ceramic ins; solder lug connections; 3/8" opening; Natl Co. #SPP-3	E624: Cap for V503. E629: Cap for V502. E1409: Plate cap of V1404.	2Z2712.1
E633	CLIP, electrical: fuse; 60 amp, 600 v; 1-9/32" x 1-5/32" x 23/32" thk; Multi-Elec #2026-S.	Fuse and capacitor clips.	2Z2712.203
E632	CLIP, electrical: fuse and capacitor clip; 31-60 amp, 250 v; 1-5/32" x 3/4" x 23/32"; Multi-Elec type #2022J.	Fuse and capacitor clip.	2Z2712.420
E638	CLIP, electrical: fuse; 13/16" x 5/8" x 19/32" 0-30 amp, 250 v; Multi-Elec #2020-J.	Fuse and capacitor clips.	2Z2712.421
E637	CLIP: fuse; 9/32" dia cartridge fuse; silver pl phosphor bronze; 17/32" lg x 13/32" wd x 25/64" thk o/a; .175" dia hole in base; 9/32" max jaw opening; Collins Rad part/dwg #265 1004 00.	Fuse and capacitor clips.	2Z2712.361
E639	CLIP: fuse; for 13/32" dia cartridge fuse; silver pl phosphor bronze; .738" lg x 7/16" h x .459" wd o/a; .195" dia mtg hole in base; 13/32" max jaw opening; Collins Rad part/dwg #265 1005 00.	Fuse and capacitor clips.	3Z1013.5
L501	COIL, RF: Navy type #-472506; choke; 1 pie universal wdg; unshielded; 50 uh; not tuning coil, 73 turns #30 AWG wire; 1-3/8" lg x 1/2" dia o/a; ceramic form; 3/8" OD x 1-3/8" lg; single hole mtg; 2 cotter pin term.; Collins Rad part/dwg #503 9136 002.	V501 plate choke.	3C1084-119
L502, L505, L507	COIL, RF: choke; single wnd 4 pie, dua lateral wdg; unshielded; 2.5 mh, ±10% .125 amp, 50 ohms d-c resistance 1.5 uuf max distributed cap, 1-15/16" lg x 1/2" dia o/a; ceramic form; single mtg hole #6-32 tapped 3/8" d in base; 2 brass cotter pin term., one each end of coil; Collins Rad part/dwg #240 0036 00.	L502: V502 plate choke. L505: V503 plate choke. L507: V504 grid choke.	3C326-100.2

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
L504, L522	COIL, r-f; choke; single wdg; unshielded; 21 right hand turns #12 bus wire; 13/16" OD, 5/8" ID, 3-7/8" lg less term.; air core; term. mtg; two 55/64" lg lug term., 1 ea end, 4-7/8" c to c; Collins Rad part/dwg #504 5342 001.	L504: V503 grid choke. L522: R-f choke intermediate power amplifier plate.	3C357-73
L508	COIL, r-f: antenna grounding choke; single layer wdg; unshielded; 30 right hand turns, ct, #12 bus wire; 2-25/32" dia x 6" lg o/a; glazed isolantite form, air core; form 2-1/2" dia x 6" lg; term. mtg; three solder lug term.; Collins Rad part/dwg #504 6271 003.	Antenna ground choke.	3C1084S-96
L509	COIL, r-f: Navy type #-472509; tank; left hand wdg; unshielded, 22.5 uh, 10 amp r-f; 27-1/2 turns, 1/4" x .125" edgewise copper strip silver pl; 13-15/16" lg x 4" wd x 6-1/2" h o/a; air core; main winding rotates, cont carriage slides along rod; four 17/64" dia mtg holes on 3" x 12-3/4" mtg/c; 3 screw type term. on top; mycalex insulation; Collins Rad part/dwg #503 9223 003.	V504 plate inductance.	3C1084S-97
L510, L511, L512	COIL, r-f: choke; single wdg, single layer wdg; unshielded; 70 turns #24 AWG wire; 7-15/16" lg x 1-1/2" dia o/a; isolantite form, air core; 7" lg x 1" dia; 1 solder lug term. at ea end; Collins Rad part/dwg #504 2023 002.	L510: V504 plate choke. L511: V506 grid choke. L512: V505 grid choke.	3C357-74
L516	COIL, r-f: plate tank; single wdg, single layer wdg; unshielded; 6 LH turns 5/8" soft copper rod; 11-5/32" dia x 11-3/4" lg o/a; coil fastened to mycalex bars; Collins Rad part/dwg #503 9265 003.	V505 plate tank coil.	3C1084S-98
L517	COIL, r-f: plate tank; single wdg, single layer wdg; unshielded; 6 right hand turns 5/8" soft copper rod; 14-1/2" dia x 13-1/2" lg o/a; coil fastened to mycalex bars; Collins Rad part/dwg #503 9264 003.	V506 plate tank coil.	3C1084S-99
L518	COIL, r-f: antenna; single wdg, single layer wdg; unshielded; 5-1/2 left hand turns 5/8" soft copper rod; 14" dia x 8" lg o/a; coil fastened to mycalex bars; Collins Rad part/dwg #503 9270 003.	Left antenna coupling coil.	3C1084S-100
L519	COIL, r-f: antenna; single wdg, single layer wdg; unshielded; 5-1/2 right hand turns 5/8" soft copper rod; 14" dia x 8" lg o/a; coil fastened to mycalex bars; Collins Rad part/dwg #503 9269 003.	Right antenna coupling coil.	3C1084S-101
L520	COIL, RF: choke; single wdg, single layer wdg; unshielded; 2 turns #14 wire; 2-3/16" lg x 9/16" wd x 7/8" h o/a; air form and core; 3/8" ID coil; term. mtg; one solder lug term. ea end; wdg counterclockwise; Collins Rad part/dwg #504 4313 002.	R-f choke coil in grid of V505.	3C357-75
L521	COIL, r-f: choke; single wdg, single layer wdg; unshielded; 2 turns #14 wire; 2-3/16" lg x 9/16"	R-f choke coil in grid of V506.	3C357-76

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	wd x 7/8" h o/a; air form and core; 3/8" ID coil; term. mtg; one solder lug term. ea end; wdg clockwise; Collins Rad part/dwg #504 4312 002.		
T501	COIL, RF: Navy type #-741507; choke; single universal wnd; unshielded; 280 uh ±10%; 200 turns tapped at 152 uh; 1-3/8" lg x 5/16" dia o/a; ceramic form, air core; form 3/8" dia x 1-3/8" lg; single 6-32 NC-2 x 1/4" mtg hole; 3 lead term. brought out on lower side of wnd to coil form; Collins Rad part/dwg #503 9531 002.	R-f grid V501.	3C315-161
P501	CONNECTOR, plug: Navy type 491976; 30 round female pol cont; 90 deg angle; 3-13/32" lg x 2-29/32" wd x 2-1/2" d; Cannonelec #IK-30-23C-1; Collins Rad part/dwg #370 2023 00.	Upper front cable plug, mates with J501.	2Z3082-134
P502	CONNECTOR, plug: 30 round male cont; 90 deg angle; 2-23/32" lg x 2-9/16" wd x 3-7/16" d; Cannonelec #RIK 30-23C-1-1/8; Collins Rad part/dwg #370 2036 00.	Upper front cable plug, mates with J502.	2Z3046.46
	RADIO FREQUENCY CABLE RG-58B/U.		1F425-58B
P503, P506, P1201, thru P1212	CONNECTOR, plug: Radio Frequency Plug UG-88/U; single round male cont; straight; 1-1/32" lg x .563" dia o/a; 52-ohm impedance; cylindrical metal body; teflon insert; cable opening .212" dia; incl rubber gasket and washer and brass braid clamp; Industrial Products Co #1200.	P503, P506: R-f output to frequency monitor. P1201 thru P1203: Patch cord plugs. P1204 thru P1212: Plug connector. P1205 thru P1212: Patch cord plug.	2Z7390-88
P504, P505, P520, P521	CONNECTOR, plug: Radio Frequency Receptacle UG-59A/U; single male cont; straight; 1-3/8" lg x 27/32" OD; cylindrical brass body; cable opening .437" dia; threaded 3/4" - 20 NEF-2 for mtg; u/w Radio Frequency Cable RG-8/U; Industrial Products Co #9300.	P504: Single side-band excitation. P505: Single side-band excitation input. P520: Used to connect J518 to external single side-band transmitter. P521: Used to connect J519 to external single side-band transmitter.	2Z7390-59A
P509	CONNECTOR, plug: 9 round female cont; straight; 2-3/16" lg x 1-23/64" OD; 10 amp cont rating; cylindrical aluminum tin plated body; molded phenolic insert; 21/32" diam cable opening; cable mtd; knurled coupling ring; Cannonelec #GK-9-21C-5/8.	Connects crystal oscillator.	
P510 thru P514, P522	CONNECTOR, plug: 7 round female pol cont; straight; 1-1/4" OD x 1-11/16" lg o/a; cylindrical metal body, threaded 7/8"-20 NEF-2 for locking; molded bakelite insert; knurled coupling ring,	P510: Connector for Z701. P511: Connector for Z702.	2Z8677.14

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	threaded 1"-20 NEF-2 for locking;Amphenol type AN3107-16S-1S.	P512: Connector for Z703. P513: Connector for Z705. P514: Connector for Z706. P522: Connector for K506.	
P515	CONNECTOR, plug: 3 round male pol cont; straight; 1-11/16" lg x 1-1/8" dia o/a; cylindrical metal body; phenolic insert; .526" cable opening; thd 3/4"-20 NEF-2 mtg; type AN3106-14S-1P; Collins Rad part/dwg #357 9052 00.	Frequency shift keyer key input line.	2Z7113.16
P516	CONNECTOR, plug: three curved twistlock male cont pol; straight; 1-17/32" dia x 1-11/32" lg less cont, incl cable clamp; cont 10 amp 250 v, 15 amp 125 v; round rubber body; hard rubber insert; .296" to .562" dia cable opening; incl cable clamp; Hubbel #7567.	A-c power cable to keyer power supply.	6Z7591-25
P517, P518	CONNECTOR, plug: two spring-action male cont; straight; 1-5/16" dia x 1-11/16" lg less cont; black rubber body; 3/8" dia cable opening; handle grip type cap; Allied Elec #102.	P517: A-c power line to crystal oscillator. P518: A-c power line to frequency shift keyer.	2Z3022-203
J523, P524	CONNECTOR, receptacle: 45 round female pol cont; straight; 3-3/8" lg x 1-11/16" wd x 1-7/32" thk o/a; 43 cont 10 amp, 2 cont 30 amp; rectangular aluminum body; phenolic insert; four .144" dia mtg holes on 2.875" x 1.000" mtg/c; Cannonelec #DPD-45-33S-1.	Connect lower front door to cabinet.	2Z3082-140
P525 thru P531	CONNECTOR; plug: 20 female cont; straight type; 2-3/32" lg x 13/16" wd x 13/32" h excluding cont; 7.5 amp, 750V AC RMS; rectangular, black phenolic body, brass silver pl cont; phenolic insert; two 1/8" diam mtg holes spaced 1.842" c to c; Cinch #54A-14516.	Connects Z518.	
P523	CONNECTOR, receptacle: 45 round male pol cont; straight; 3-3/8" lg x 1-11/16" wd x 1-9/32" thk o/a; 43 cont 10 amp, 2 cont 30 amp; rectangular aluminum body; phenolic insert; four .144" dia mtg holes on 2.875" x 1.000" mtg/c; Cannonelec #DPD-45-34P.	Connect lower front door to cabinet.	2Z3046.52
P802	CONNECTOR, plug: 30 round male cont pol; straight; 2-9/16" dia x 2-13/16" lg o/a; 10 amp cont; round metal body; phenolic insert; 29/32" dia cable opening; 2-5/16"-6 special Acme thd; integral mtg clamp; Cannonelec cat #RIK-30-22C-7/8.	Servo amplifier connector.	2Z3046.50

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
J503, J504, J506 thru J508	CONNECTOR, receptacle: Jack UG-291/U; single round female cont; straight; 1-1/16" lg x 11/16" wd x 11/16" h o/a; cylindrical brass body threaded 3/8"-32 NEF-2 for locking; teflon insert; cable opening .212" dia; metal mtg fl w/four #3-56 NEF-2 tapped holes on .500" x .500" mtg/c; Industrial Products Co #5000.	J503: R-f output to frequency monitor. J504: R-f input to transmitter. J506, J507, J508: For external circuit.	2Z3062-167
J501	CONNECTOR, receptacle: 30 round pol male cont; straight; 2-5/16" x 2-5/16" x 27/32" h; Cannonelec #IK-30-325; Collins #370 2026 00.	Upper front door panel jack.	2Z3046.47
J502, J517	CONNECTOR, receptacle: Navy type 491977; 2-9/16" wd x 1-9/16" d x 15/16" h; 30 round pol female cont; Cannonelec #RIK 20-31SL; Collins Rad part/dwg #370 2025 00.	J502: Upper front door panel jack. J517: Servo amplifier.	2Z3082-135
J509	CONNECTOR, receptacle: 9 round female pol cont; straight; 3/4" lg x 1-3/16" OD less cont; cont 10 amp; cylindrical metal body; w/four 1/8" dia holes on 11/16" mtg fl; Cannonelec catalog #GK-9-32S.	Connects crystal oscillator.	
J510	CONNECTOR, receptacle: three round female pol cont; straight; 1-5/16" lg x .906" dia; cylindrical metal body threaded 7/8"-20 NEF-2 for locking; molded phenolic insert; 1/2" cable opening; box mtg 1-3/16" wd x 1-3/16" h 1/16" thk; Amphenol type AN-3102-14S-1S.	Key line output for frequency shift keyer.	2Z8673.20
J511, J512, J513	CONNECTOR, receptacle: Navy type #491453; double T slots; straight; 2-1/16" lg x 1-17/64" wd x 1" d o/a; cont 10 amp, 250 v, 15 amp 125 v, round black comp body; mtg bkt w/two 8-32 tapped holes 1-5/8" c to c; Hubbell #7255.	J511: Used with Frequency Shift Keyer KY-45/FRT-5. J512: Used with RF Oscillator O/91/FRT-5. J513: 115-volt a-c for crystal oscillator and miscellaneous circuits.	6Z7788
J514, J515	CONNECTOR, receptacle: Navy type #491014; 3 female pol cont; straight; 2-5/16" lg x 1-3/4" wd x 1-11/32" d; cont 10 amp, 250 v, 15 amp, 125 v; round black bakelite body, Twist-lock; mtg fl w/two 5/32" dia holes 1-5/16" c to c; Hubbell #7557G.	J514: Used with Power Supply PP-454/FRT-5. J515: For use as a spare connector.	6Z7813-1
J516	CONNECTOR, receptacle: Navy type #49809; 3 female pol cont; straight; 2-7/8" dia x 1-7/8" d o/a; cont 20 amp 250 v a-c or d-c, 10 amp 575 v a-c; round black comp body, Twist-lock; cable opening 5/8" dia; mtg flange w/three 13/64" dia holes on 1-1/4" rad 120 deg apart; Hubbell #7328G.	230 volts for press wireless keyer.	6Z7811-10
J518, J519	CONNECTOR, receptacle: 1 round male cont; straight; 1-3/8" lg x 1-3/16" wd x 1-3/16" h less	J518: Single side-band excitation.	2Z3055-26

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	cont; cylindrical metal body threaded 3/4"-20 NEF-2 for locking; teflon insert; cable opening 23/32" dia; metal mtg fl w/four .125" dia holes on .906" x .906" mtg/c; Cable Trimmer MX-103/U used for assy; Industrial Products Co. #9450.	J519: Single side-band excitation input.	
J524	CONNECTOR, receptacle: 45 round female pol cont; straight; 3-3/8" lg x 1-11/16" wd x 1-7/32" thk o/a; 43 cont 10 amp, 2 cont 30 amp; rectangular aluminum body; phenolic insert; four 0.144" diam mtg holes csk at 82 deg to .281" diam on 2.875" x 1.000" mtg/c; Collins Rad part/dwg #506 7684 002.	Connects lower front door to cabinet.	
J522, J701	CONNECTOR, receptacle: 7 round male pol; straight; 1-9/32" wd x 1-9/32" h x 1-13/32" lg less cont; cylindrical metal body, threaded 1-20 NEF-2 for locking; molded bakelite insert; metal mtg flange w/four .120" dia holes on 31/32" x 31/32" mtg/c; Amphenol type AN3102-16S-1P.	J522: Used to connect K506. J701: Connects power cable to servo drive unit.	2Z7117.11
J702	CONNECTOR, receptacle: 20 round male cont; straight; 1-31/32" lg x 3/4" wd x 5/16" h less cont; 7.5 amp, 700 v AC RMS; rectangular, black phenolic body, brass silver pl term; phenolic insert; two 1/8" diam holes spaced 1-23/32" c to c; Collins Rad part/dwg #372 1037 00.	Connects Z518.	
J801 thru J809	CONNECTOR, receptacle: Navy type #491134-A; 10 rectangular female pol cont; straight; 2-5/16" lg x 1-3/16" wd x 31/32" h less cont and mtg bkt; black finish; molded bakelite insert; 2 mtg bkt w/.147" dia holes 2-15/16" c to c; Jones HB #SS-10-AB1/16.	J801: Connector for Z801. J802: Connector for Z802. J803: Connector for Z803. J804: Connector for Z804. J805: Connector for Z805. J806: Connector for Z806. J807: Connector for Z1504. J808: Connector for Z1503. J809: Connector for Z1502.	2Z3071
P801	CONNECTOR, receptacle: Navy type #49146; 10 rectangular male pol cont; straight; 2-5/16" lg x 1/2" wd x 3/8" thk less lugs, cont, and mtg bkt; rectangular molded bakelite body; bakelite insert; mtg bkt ea end w/.147" dia holes on 2-15/16" c to c; Jones HB #P-10-AB1/16.	Servo amplifier connector.	2Z3071-3
E646, E647	CONTACT, electrical: gear shorting slotted spring; beryllium copper, hard chrome pl; rectangular, curved to 1/4" rad 1/2" from end; .020" thk x 1-13/16" lg x 1" wd x 1/4" h o/a; single	E646: Shorts O501 and O502 to ground. E647: Shorts C571.	2Z3193-210

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	.281" dia mtg hole; Collins Rad part/dwg #504 5159 001.		
E648	CONTACT, case: shield wiper spring; beryllium copper, hard chrome pl; angular shape; .020" thk x 1-1/2" lg x 1" wd x 1-3/8" h o/a; two .187" dia mtg holes spaced .500" c to c; Collins Rad part/dwg #504 5162 001.	Grounds output network.	2Z3193-211
L509A	CONTACT, coil: replacement; fine silver cont buttons riveted on silver pl beryllium copper spring; 15 amp r-f cont; 2-1/16" lg x 1-1/4" wd x 1-1/2" h o/a; Johnson EF type #23.274-1.	V504 plate inductance.	2Z3191-321
L516A, L517A	CONTACT, coil: silver pl brass; rigid, 1 cont; 8" lg x 7/8" wd x .937" h o/a; 4 holes 4-40 NC-2 x 1/4" d .312" c to c on top and bottom, 4 holes 4-40 NC-2 x 1/4" d .281" c to c on opposite sides, one 3/16" dia hole through bar from side; Collins Rad part/dwg #504 1487 003.	L516A: Part of V505 plate tank coil. L517A: Part of V506 plate tank coil.	2Z3193-212
L516B, L517B	CONTACT, coil: cont plug spring, flex; beryllium copper, chromium pl; U shape; 1" lg x .421" wd x .812" d o/a; Collins Rad part/dwg #504 1483 001.	L516B: Part of V505 plate tank coil. L517B: Part of V506 plate tank coil.	2Z3191-330
L516C, L517C	CONTACT, coil: top and bottom; silver pl beryllium copper; C shape; .427" wd bent at .687" ID; Collins Rad part/dwg #504 1488 003.	L516C: Part of V505 plate tank coil. L517C: Part of V506 plate tank coil.	2Z3191-323
L516D, L517D, O536	CONTACT, coil: wiper, flex type; beryllium copper hard chromium pl arm and cont; 1-9/16" lg at ctr w/1-13/16" lg bend at 45 deg angle on ea side; 4-1/4" lg x 3/8" wd x 1-3/8" h o/a, 2 round cont 3/8" dia x 1/32" thk; two .187" dia holes 3/4" c to c; Collins Rad part/dwg #503 9068 002.	L516D: Part of V505 plate tank coil. L517D: Part of V506 plate tank coil. O536: Shorts IPA tank coil drum.	2Z3191-324
L516E, L517E	CONTACT, coil: inside; silver pl brass; U shape; 1-3/16" lg x .875" wd x .615" d o/a; Collins Rad part/dwg #504 1486 002.	L516E: Part of V505 plate tank coil. L517E: Part of V506 plate tank coil.	2Z3191-325
L518B, L519B	CONTACT, coil: spring type; chromium pl beryllium copper; U shape; 15/16" lg x 5/8" wd x .296" h o/a; Collins Rad part/dwg #504 1946 001.	L518B: Part of left antenna coupling coil. L519B: Part of right antenna coupling coil.	2Z3191-326
L518C, L519C	CONTACT, coil: top and bottom; silver pl copper; C shape; .343" wd bent at .687" ID; Collins Rad part/dwg #504 1489 003.	L518C: Part of left antenna coupling coil. L519C: Part of right antenna coupling coil.	2Z3191-327
L518D, L519D	CONTACT, coil: inside; silver pl brass; U shape; 1-3/16" lg x 11/16" wd x .484" d o/a; Collins Rad part/dwg #504 1949 002.	L518D: Part of left antenna coupling coil. L519D: Part of right antenna coupling coil.	2Z3191-328

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
L518E, L519E	CONTACT, coil: spring type; silver pl beryllium copper; irregular shape; 15/16" lg x 11/16" wd x .436" h o/a; two .120" dia holes on top, .312" c to c; Collins Rad part/dwg #504 1948 001.	L518E: Part of left antenna coupling coil. L519E: Part of right antenna coupling coil.	2Z3191-329
XV505D XV506D	CLIP, electrical: p/o mtg for tubes #3X2500-A; 36 equally spaced fingers on spring soldered to ring; silver pl beryllium copper; 3.512" OD x 2-15/16" ID x .312" thk o/a; six #4-40 NC-2 tapped holes equally spaced at 60 deg around ring; Collins Rad part/dwg #503 8937 002.	XV505D: Part of tube socket XV505. XV506D: Part of tube socket XV506.	2Z2712-192
XV505E XV506E	CLIP, electrical: p/o mtg for tubes #3X2500-A; c/o connector ring casting, cathode support ring, connector spring; brass, silver pl; 7-5/8" dia x 1-1/32" thk o/a; three 1/2" dia mtg holes equally spaced, 13/32" from ctr of holes to edge of casting; Collins Rad part/dwg #503 9193 003.	XV505E: Part of tube socket XV505. XV506E: Part of tube socket XV506.	2Z2712.423
XV505F	CLIP, electrical: left inner fil cont ring; p/o tube socket for #3X2500-A; 2 springs riveted to inside of connector ring; silver pl beryllium copper spring w/fingers bent to make 12 cont surfaces, ea .111" wd; 7-9/64" h x 4-9/32" d x 5-3/4" wd o/a; three 1/2" dia mtg holes on 2-7/8" rad spaced 120 deg in connector ring; Collins Rad part/dwg #503 9120 002.	Part of tube socket XV505.	2Z2712.424
XV506F	CLIP, electrical: right inner fil cont ring; p/o tube socket for #3X2500-A; 2 springs riveted to inside of connector ring; silver pl beryllium copper spring, silver pl connector ring; 3/4" dia x 13/16" lg cont spring w/fingers bent to make 12 cont surfaces, ea .111" wd; 7-9/64" h x 4-9/32" d x 5-3/4" wd o/a; three 1/2" dia mtg holes on 2-7/8" rad spaced 120 deg in connector ring; Collins Rad part/dwg #503 9121 002.	Part of tube socket XV506.	2Z2712.425
O568	DETENT, switch: 12 position, 30 deg rotary detent; c/o rotor and spring, ball brg and spacers on detent plate; phosphor bronze cad pl rotor and spring, SS ball brg, brass, cad pl spacers and brass nickel pl hdw; oblong; 1-15/16" lg x 15/16" wd x 1-1/2" h o/a; two #5-40 NC-2 mtg studs located on bar spaced 1-9/16" c to c; accom 1/4" dia shaft w/flats; G. H. Leland, Inc. #A-5863.	O 563 positioning detent plate.	3Z3345-10
E566, E567	DIAL: drum; aluminum; 7/8" dia x 1-7/32" d o/a, 11/16" d shaft hole; for 5/8" max dia capacitor shaft single 1/4-28 NF-2 tapped mtg engraved No. 1 thru 10; engraved Nos. 1-10; Collins Rad part/dwg #503 8939 002.	E566: Knob for neutralizing capacitor on V505. E567: Knob for neutralizing capacitor on V506.	2Z3723-494
E695, F699.1 thru .60	DIAL: movable scale type control dial; aluminum black anodized; round; 1-5/32" OD x 3/4" d; accom 1/8" diam shaft; 1/4" diam bushing; 1/4-32 NEF-2 thds; w/markings; dial indicate propor-	E695: Tuning control. F699.1 thru .60: Servo panel control.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	tion of total multi-turn coil length traversed by sliding contact; Helipot Corp type SR-100.		
O 1248	DIAL: knob type; molded black phenolic; 100 scale divisions, marked 0 to 90 in units of 10, 360 deg cal; round; 1-3/4" dia x 7/8" thk o/a; two .187" dia holes spaced 90 deg tapped 8-32 in brass insert, accom 1/4" dia shaft; Collins Rad part/dwg #503 8082 002.	Servo control knobs for R591 through R596.	2Z3723-260
Z509	DRIVE, tuning: servo motor drive unit; incl 2 micro sw, 2 ball bearings, 2 connectors, one 5000 ohm variable resistor, 1 components mtg plate, 1 base bearing plate, first reduction gear, output shaft, variable resistor drive gear assem and one 4 uuf fixed capacitor; 115 v AC, 160 ma per phase at full load on large motor, 125 ma per phase at full load on small motor; rectangular; large box 6-11/16" x 3-9/16" x 5-1/2", small box 5-3/16" x 3-9/16" x 5-1/4"; mts by two #8-32 x 5/16" lg machine screw; Collins Rad part/dwg #504 1081 004.	V504 tuning.	
O 560, O 711	DRUM, brake: SS type #303; 1.005" OD x .161" ID x 1/2" d; Collins Rad part/dwg #505 7511 002.	Stops B502.	2Z3880-12
F501, F502, F503	FUSE, cartridge: Navy type 28053-1; lamp 250 v; Littelfuse type 3AG #1268; Collins Rad part/dwg #264 4280 00.	F501: Exciter filament transformer primary. F502: Driver filament transformer primary. F503: Protects T504.	3Z2601.16
O 501, O 502	GEAR: spur; aluminum gear, mycalex ins ring, phosphor bronze hub; shorting bar driving; straight teeth, 20 deg pitch arc; 276 teeth; PD 11.5, diametral pitch 24; 11-3/4" dia x 3/4" thk o/a; straight face; hub 3.250" max OD, 1.755" max ID, 3/4" thk; hub mtg; Collins Rad part/dwg #503 9232 003.	O 501: Used to turn shorting bar in L519. O 502: Turns shorting bar in L518.	2Z4878-1181
O 503A, O 503B	GEAR: spur; bakelite gear w/brass hub; drives shorting bar; straight teeth, 20 deg pitch arc; 96 teeth; diametral pitch 24, PD 4"; 4.103" OD x .313" ID x 5/8" thk; straight face; 1-1/4" dia x 5/8" thk hub; .313" mtg hole in ctr; Collins Rad part/dwg #503 8971 002.	Parts of O503 antenna drive	2Z4878-1186
O 503D, O 503E,	GEAR: spur; bakelite gear, brass hub; gear driving; straight teeth, 20 deg PA; 102 teeth; diametral pitch 24, 4.250" PD; 4.353" OD x .750" ID x 1" d; straight face; 1-1/4" dia x 1" thk o/ a; 3/4" dia ctr mtg hole; Collins Rad part/dwg #503 9217 003.	Parts of O 503 antenna drive.	2Z4878-1184
O 507	GEAR: bevel; bright alloy finished brass; straight teeth, 14-1/2 deg pitch arc; 36 teeth; diametral	4 gears drive C571 and C572.	2Z4878-1183

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	pitch 24 PD 1.500"; 1.559" dia x 21/32" d o/a; straight face; 11/16" dia x 5/16" d hub; .313" dia hole thru ctr; Collins Rad part/dwg #503 9123 002.		
O 525	GEAR: spur; linen base phenolic gear, SS hub; straight teeth, 20 deg pitch arc; 96 teeth; diametral pitch 24, PD 4.000"; 4.087" OD x .590" ID x .702" thk o/a; straight face; 1.427" max dia, .702 thk o/a; .590" dia shaft hole; Collins Rad part/dwg #504 3283 003.	Drives C270.	2Z4878-1182
O 529	GEAR: spur; SS; motor driving; straight teeth, 20 deg pitch arc; 14 teeth; diametral pitch 32, PD .4375"; 1/2" OD x .188" ID x 9/16" thk, face wd 1/4"; straight face; hub .359" dia x 5/16" lg; .188 shaft hole thru ctr; Collins Rad part/dwg #504 1566 001.	Gear for motor B502.	2Z4878-1185
O 541	GEAR: spur; fabric on bakelite base; grid box drive; straight teeth, 20 deg pitch arc; 104 teeth; diametral pitch 24, PD 4.333"; 4.427" OD x 3/4" ID x 3/8" thk; straight face; hub 1/4" dia x 3/8" thk o/a; hub mtg; Collins Rad part/dwg #503 8984 002.	Part of O 537.	2Z4878-1175
O 546, O 547	GEAR: spur; fabric on bakelite base; grid box drive; straight teeth, 20 deg pitch arc; 55 teeth; diametral pitch 24, PD 2.292"; 2.385" OD x 3/8" ID x 3/8" thk; straight face; hub 1-1/4" dia x 3/8" thk o/a; hub mtg; Collins Rad part/dwg #503 8987 002.	Parts of O 537.	2Z4878-1176
O 548	GEAR: spur; fabric on bakelite base; grid box drive, straight teeth 20 deg pitch arc; 55 teeth; diametral pitch 24, PD 2.292"; 2.385" OD x 3/8" ID x 1" thk; straight face; hub 1-1/4" dia x 1" thk o/a; hub mtg; Collins Rad part/dwg #503 8988 002.	Part of O 537.	2Z4878-1177
O 553	GEAR: spur; bright alloy finished brass; gear drive; straight teeth; 60 teeth; diametral pitch 48, PD 1.250"; 1.2915" OD x .250" ID x .494" thk o/a; straight face; hub 7/8" dia; hub mtg; Collins Rad part/dwg #503 9082 002.	Drives O 552.	2Z4878A-150
O 701A, O 701B	GEAR: spur; SS type 303; motor; straight teeth; 18 teeth, 14-1/2" deg PA; 48 pitch, .375" PD; 13/32" OD x 1/4" bore x .812" h; straight face; hub extends 9/16" beyond face of gear, 1/4" OD; Collins Rad part/dwg #503 9130 002.	O 701A: Output coupling for motor on Z507. O 701B: Output coupling for motor on Z508.	2Z4872-187
O 701C	GEAR: spur; brass; motor; straight teeth, 20° PA; 24 teeth; 24 pitch, 1" PD; 1" OD x 1/4" bore x 1/4" thk; straight face; hub extends .375" beyond face of gear, 1/2" OD; Collins Rad part/dwg #503 9013 002.	Output coupling for motor on Z509.	2Z4872-191

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
O 701, O 701F	GEAR: spur; brass; motor; straight teeth; 29 teeth, 20 deg PA; 24 pitch, 1.208" PD; 1-5/16" OD x 1/4" bore x 1/4" thk; straight face; hub extends 3/8" beyond face of gear, 1/2" OD; Collins Rad part/dwg #503 8826 001.	Output coupling for motor on Z511.	2Z4872-189
O 703	GEAR: spur type; SS type #303 stop pin, commercial brass gear w/chemical polish; pot drive; American standard involute tooth form; 90 teeth; 48 pitch, 1.8750" PD; 2" OD x .093" thk face ws; straight face; 7/8" diam hub extends .250" beyond face; two .2530" diam #8-36NF-2 tap holes 90 deg apart, 1/8" from end of hub; incl stop pin .338" from center; Collins Rad part/dwg #505 8514 002.	Potentiometer drive.	
O 704	GEAR ASSEMBLY: spur type; c/o one output gear and one pinion on shaft, pinion w/24 teeth, gear w/90 teeth; SS type #303; gear pitch 48, PD 1.875", pinion 48 pitch, .5000" PD; round; 1.925" OD x 2-13/64" lg; shaft mtg; American standard involute tooth form; Collins Rad part/dwg #505 8507 002.	Servo amp power.	
O 705	GEAR ASSEMBLY: first reduction; c/o one pinion w/72 teeth and one gear w/18 teeth; bakelite gear, ternary pl (copper tin and zinc) pinion; pinion 48 pitch, PD 1.5000", gear 48 pitch and .3750" PD; round 1-5/8" OD x .810" d o/a; 1/8" ID for mtg; American standard involute tooth form; Collins Rad part/dwg #505 8511 002.	First reduction.	
O 710	GEAR ASSEMBLY: second reduction; c/o one gear and one pinion, pinion w/18 teeth, gear w/48 teeth; brass ternary pl (copper tin and zinc) gear 48 pitch, PD 1.000", pinion 48 pitch, .3750" PD; round; 1-1/16" OD x .343" lg o/a; .1560" diam for mtg; American standard involute tooth form; Collins Rad part/dwg #503 8630 002.	Second reduction.	
XF501, XF502, XF503	FUSEHOLDER: Buss type HKP-Q-LR; Collins Rad part/dwg #265 1002 00.	XF501: Mounts F501. XF502: Mounts F502. XF503: Mounts F503.	3Z3282-42.9
E525, E526	INSULATOR, stand-off: grade L-4, ceramic white glazed; 1" dia tapped 1/4-20 x 5/8" d at ea end; Collins Rad part/dwg #190 1173 00.	H-v terminal on the T-454/FRT-26 unit.	3G350-201
E549 thru E552, E554 thru E565, E568 thru	INSULATOR, stand-off: round post shape; JAN type NS4W0308.	E549, E550: Support for R542. R551, E552: Support for R541. E554, E555: Support for R586. E556, E557: Support for R588.	3G3503-08.1

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E601, E608 thru E619		E558, E559: Support for R587. R560, E561: Support for R589. E562, E563: Support for R538. E564, E565: Support for R539. R568, E571: Support for R520. E569, E572: Support for R521. E570, E573: Support for R512. E574, E579: Support for R537. E575, E580: Support for R532. E576, E581: Support for R513. E577, E582: Support for R535. E578, E583: Support for R531. E584, E585: Support for R481. E586, E587: Support for R613. E588, E589: Support for R614. E590, E595: Support for R576. E591, E596: Support for R584. E592, E597: Support for R583. E593, E598: Support for R590. E594, E599: Support for R585. E600, E601: Support for R578. E608, E614: Insulator for R559. E609, E615: Insulator for R561. E610, E616: Insulator for R558. E611, E617: Insulator for R552. E612, E618: Insulator for R553. E613, E619: Insulator for R555.	
	INSULATOR, stand-off: round post shape; JAN type NS4W0316.	Mounting insulator.	3G3503-16.3

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E545	INSULATOR, stand-off: cylindrical pillar; JAN type NS4W0312.	Supports for C567 thru C570. Supports both ends of R582 and one end of R540 and R543.	3G3503-12.2
E602 thru E607, E620 thru E628, E630, E631, E634 thru E636, E801, E802, E804, E807	INSULATOR, stand-off: cylindrical pillar; grade L-5 ceramic; 5/8" lg x 1/4" dia; #4-40 NC-2 x 3/16" d ea end; Centralab 2X783: Collins Rad part/dwg #190 1105 00.	E602: R-f monitor loop. E603: Tie point for R572 and R592. E604: Tie point for R574, R593, and R591. E605: Tie point for R592, R593, and E663. E606: Tie point for R575, R596, and E663. E607: Tie point for R612, and R595. E620: Tie point for R549, R550, and F502A-4. E621: Tie point for R617, R618, R619, and R620. E625: Tie point for R523, E506, and E136. E626: Tie point for R526, and R515. E627: Tie point for R510, R511, and C506. E628: Tie point for R513, R510, R511, and C504. E630: Tie point for R515, and XV502-4. R631: Tie point for TB05, and C519. E634: Tie point for R517, and TB-506-122. E635: Tie point for R501, R502, R503, R504, T501, and J504. E636: Tie point for C501, and J503. E801: Tie point for R814, and R817. E802: Tie point for R815. E804: Tie point for R801. E807: Tie point for R806, and R807.	3G350-128
XV5050 XV5060	INSULATOR, bowl: JAN type #NS4W4502.	XV5050: Part of tube socket XV505. XV5060: Part of tube socket XV506.	3G3545-02
E644B	INSULATOR, bowl: bowl, round ctb; JAN type #NS4W4201.	Feed through from C512 to L504.	3G3542-01.1

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E661	INSULATOR, bowl: bowl w/mtg fl; glazed isolantite; 2-3/4" h; 5-3/8" max OD x 3-1/8" max x ID, 6 holes 9/32" dia equally spaced on 4-5/8" dia bolt cir, shoulder 3-3/4" dia, 3/32" h on bottom; Genceraco #1088-00.	Antenna feedthrough.	3G1350-33
E530A, E531A, XV505H XV506H	INSULATOR, bushing: JAN type #NS4W4104.	E530A, E531A: Feedthroughs for power-amplifier grid lead. XV505H: Used to mount V505. XV506H: Used to mount V506.	3G3541-04.1
E530B, E531B, XV505I XV506I	INSULATOR, bushing: JAN type #NS4W4204.	E530B, E531B: Feedthroughs for power-amplifier grid lead. XV505I: Used to mount V505. XV506I: Used to mount V506.	3G3542-04.1
E644A, E1407	INSULATOR, bushing: conical, round shank; JAN type #NS4W4101.	E644A: Feedthrough from C512 to L504. E1407: Feedthrough for plate lead from L1410 to plate cap V1404.	3G3541-01.1
XV505L XV506L	INSULATOR, standoff; round post shape; JAN type #NS4W0308.	XV505L: Mounts V505. XV506L: Mounts V506.	3G3503-08.1
E664, thru E687, XV505G XV506G	INSULATOR, bushing: conical, round shank; JAN type #N4W4003.	E664 thru E675: Spacer and filament ring supports for V505. E676 thru E687: Spacer and filament ring supports for V506. XV505G: Used to mount V505. XV506G: Used to mount V506.	3G3540-03.1
E808 thru E811	INSULATOR, feedthrough: round; grade L-5 ceramic; 27/32" lg; 13/32" o/a dia; incl 17/32" lg lug for wire; Rohden type #502.	Feedthrough to T801.	3G290-42
O 517, O 518	INSULATOR, plate: sq; glass bonded mica; 4.078" sq x 1/4" thk, corners rounded 5/8" rad; 4 mtg holes .687" dia on 2.828" mtg/c; Collins Rad part/dwg #504 3276 001.	O 517: Part of L516 shorting bar drive coupler. O 518: Part of L517 shorting bar drive coupler.	3G320-164
E529, XV505P XV506P	INSULATOR, stand-off: round post shape; grade L-4 ceramic, white glaze on heavy lined surfaces; 4" lg; 1" dia o/a, tapped 1/4-20" x 5/8" d at end; Collins Rad part/dwg #190 1176 00.	E529: Plate cap support for V505 and V506. XV505P: Used to mount V505.	3G1250-64.18

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		XV506P: Used to mount V506.	
E532, E533	INSULATOR, stand-off: round post shape; grade L-4 ceramic, white, glazed except ends; 1/2" lg; 3/8" dia, tapped #6-32 x 5/32" d at ea end; Isolantite; Collins Rad part/dwg #190 1141 00.	E532: Right-hand parasitic suppressor support for the T-225/FRT unit. E533: Left-hand parasitic suppressor support for the T-225/FRT unit.	3G350-127
E534 thru E543, XV505N XV506N	INSULATOR, stand-off: conical shape; JAN type #NS4W2016.	E534: Support for C527. E535: Support for C528. E536: Support for C529. E537: Support for C530. E538: Support for C531. E539: Support for C527. E540: Support for C528. E541: Support for C529. E542: Support for C530. E543: Support for C531. XV505N: Used to mount V505. XV506N: Used to mount V506.	3G3520-16.1
E544, XV505M XV506M	INSULATOR, stand-off: cylindrical pillar; JAN type #NS4W0324.	E544: Term angle support for C526. XV505M: Used to mount V505. XV506M: Used to mount V506.	3G3503-24.2
E546, E547, E662, XV505K XV506K	INSULATOR, stand-off: round post shape; Isolantite, glazed surface; 1" lg 1/2" dia o/a; tapped #6-32 x 3/8" d ea end; Collins Rad part/dwg #190 2327 00.	E546: Support for L510. E547: Support for L510. E662: Mounting insulator for R525. XV505K: Used to mount V505. XV506K: Used to mount V506.	3G3501-08.2
E548, E553, E623, E659, E660, XV505J XV506J	INSULATOR, stand-off: round post shape; JAN type #NS4W0105.	E548: Support for L512. E553: Support for L511. E623: Insulator for C519. E659: Support for L512. E660: Support for L511. XV505J: Used to mount V505. XV506J: Used to mount V506.	3G3501-05
E622	INSULATOR, stand-off: cylindrical pillar; JAN type #NS4W0106.	Insulator for C518.	3G3501-06.1

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E645	INSULATOR, stand-off: cylindrical pillar; grade L-4 ceramic, white glazed; 3" lg; 1" dia, tapped 1/4-20" x 5/8" d at ea end; Collins Rad part/dwg #190 1175 00.	Support for S505, M503, S506, M504, and shorting contact bar on L516 and L517.	3G3504-24.1
E655, E656, XV505Q XV506Q	INSULATOR, stand-off: cylindrical pillar; grade L-4 ceramic, white, glazed; 5" lg; 1" dia, tapped 1/4-20" x 5/8" at ea end; Collins Rad part/dwg #190 1177 00.	E655, E656: Supports for C526. XV505Q: Used to mount V505. XV506Q: Used to mount V506.	3G350-135
E657, E658	INSULATOR, stand-off: round post shape; JAN type #NS4W0206.	E657: Support for C541. E658: Support for C542.	3G3502-06.2
J505	JACK, telephone: Navy type #-49021-A; for 2 cond plug 1/4" dia; 3-1/4" lg x 1-1/8" wd x 1/2" h o/a; J7 cont arrangement; incl 1 hex. nut and 1 washer; 5/32" dia mtg hole; Mallory cat. #CMA-49021A.	Phone jack for frequency monitor.	
E693, E694, E696	KNOB: round; black phenolic; for 1/4" dia shaft; 1-3/4" dia x 7/8" d; Collins Rad #503 2377 002.	E693: Knob for S512. E694: Knob for S513. E696: Knob for R560.	2Z5824.131
E698, E699	KNOB: round; black phenolic; for 1/4" dia shaft; 2-1/4" dia x 1-17/64" thk; Collins Rad #502 9138 002.	E698: Knob for S505. E699: Knob for S506.	2Z5824.132
E692	KNOB: round; black anodize aluminum; for 1/4" dia shaft; two 6-40 NF-2 tapped holes at 90°; 5/8" lg white arrow; 13/16" dia x 3/4" lg o/a; 1/2" d shaft hole; med diamond knurl; Collins Rad part/dwg #503 4090 001.	Knob for S501.	2Z5824.166
E697	KNOB: round; black anodize aluminum; for 1/4" dia shaft; two 6-40 NF-2 tapped holes at 90°; 5/8" lg arrow on top, 1/4" lg engraved line on side; 13/16" dia x 3/4" lg o/a; 1/2" d shaft hole; med diamond knurl; Collins Rad part/dwg #504 2115 001.	Knob for C535.	2Z5824.167
I502, I503 I504	LAMP, glow: 110 v to 120 v a-c or d-c, 1/10 w; rectangular translucent white 1-7/8" lg; Littelfuse #201001.	I502: Fuse failure indicator for F501. I503: Fuse failure indicator for F502. I504: Blown fuse indicator for F503.	2Z5889-27
E501, E505, thru E512	LAMP, incandescent: 120 v, 6 w; double cont bayonet candelabra base; Collins Rad #262 0041 00.	E501: Bias pilot. E505: Power amplifier filament pilot. E506: H-v on pilot. E507: Overload pilot. E508: Meter light for M502. E509: Meter light for M507.	6Z6810-6

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		E510: Meter light for M501. E511: Meter light for M506. E512: Meter light for M505.	
XI 509 thru XI 512	LAMPHOLDER: double cont candelabra bayonet base; 1-9/16" lg x 1" wd x 1-1/8" h; Dialco #9-S-4634-L-46.		2Z5988-39
XI 505A, XI 507A	LENS, indicator light: amber; threaded type; 1-9/64" OD x 35/64" lg; Collins #262 0106 00.	XI 505A: Part of indicator light XI 505. XI 507A: Part of indicator light XI 507.	2Z6125-262
XI 501A	LENS, indicator light: green; threaded type; 1-9/64" OD x 35/64" thk; Collins Rad #262 0104 00.	Part of indicator light XI 501.	2Z6125-263
XI 506A	LENS, indicator light: red; threaded type; 1-9/64" OD x 3/64" thk; Collins Rad #262 0104 00.	Part of indicator light XI 506.	2Z6125-264
XI 501, XI 505 thru XI 507	LIGHT, indicator: w/o lens; for double cont candelabra base: 2-5/8" lg x 1-3/8" OD; Dialco #51702-67.	XI 501: Mounts I 501. XI 505: Mounts I 505. XI 506: Mounts I 506. XI 507: Mounts I 507.	2Z5991-377
XV505A, XV506A	LINE, air: upper; air duct; heatproof glass, grade L-4; 5" OD x 4-29/32" ID x 2-7/32" lg; ends gnd; Collins Rad part/dwg #192 1012 00.	XV505A: Part of tube socket XV505. XV506A: Part of tube socket XV506.	2Z3600B-1
I 801, I 802	LAMP, glow: 90 v d-c or 65 v a-c w/ext series res, 1/25 w; bulb 9/32" dia clear; 1-7/8" lg o/a incl wire leads; no base, two 13/16" leads from one end; no fil, 2 electrodes in neon-filled envelope; burn any position; GE cat. #NE-2.	Indicator lights.	2Z5954
I 513.1 thru I 513.10	LAMP, incandescent: 6.3 v, 0.15 amp; bulb T-3-1/4 clear; 1-1/8" lg o/a; miniature bayonet base; tung fil; burn any position; GE type #47.	Channel indicators.	2Z5932
I514.1 thru .10 thru I519.1 thru .10	LAMP, incandescent: 6 v, .200 amp; bulb T-1-3/4 clear; 5/8" max o/a lg; midget fl base; tungsten filament; burn any position; GE Mazda #328.	Channel illumination.	
XI513 .1A thru XI513 .10A	LENS, indicator light: red; threaded type; bezel 21/32" OD x 3/16" wd; Drake Mfg type #25.	For I 513A thru I 513J.	
XI 513.1	LIGHT, indicator: w/o lens; for miniature bayonet base, T-3-1/4 Bulb; 6-8 v; open shell; 1-1/8" lg	Mounts I 513A thru I 513J.	2Z5991-221

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
thru XI 513 .10	x 15/16" dia; 11/16" dia mtg hole required, 0"-1/4" panel thk; horiz mtg; 2 solder lug term. on base of socket; Drake Mfg type #225A.		
XV505B, XV506B	LINE, air: lower grid cyl; 5-5/64" OD x 4-47/64" ID x 31/32" lg; heatproof glass, grade L-4; ends gnd; Collins Rad part/dwg #192 1011 00.	XV505B: Part of tube socket XV505. XV506B: Part of tube socket XV506.	2Z10004
O 511A	MAINTENANCE PARTS KIT: for Link-Belt silent chain #S-1807; Link-Belt; Collins Rad part/dwg #233 0033 00; c/o 5 ft chain, 50 coupling pins, 10 side fl.	Chain repair kit.	2Z5727-142
O 519A	MAINTENANCE PARTS KIT: for Link-Belt silent duplex chain #D-1810; Link-Belt; Collins Rad part/dwg #233 0038 00; c/o 10 ft chain,100 coupling pins, 20 side fl.	Chain repair kit.	2Z5727-145
M501	METER, ammeter: d-c; range 0-500 ma; rectangular, flush, black bakelite case; 2.75" x 2.88" body, 1.46" d, behind fl, 3" x 3.13" x 3/16" fl; 2% accuracy for full-scale reading; calibrated for 3/32" thk steel panel; 50 scale divisions, black markings on white background, window in top of case for illumination; self-contained; 2 mtg lugs fastened on bottom of case, two 8-32 NC-2 x 1-1/4" screws; 2 screw type term. 1/4"-28 NF-2, 3/4" lg; Weston model 731.	V504 cathode current meter.	3F9050-70
M502	METER, ammeter: range 0 - 8 amp; rectangular, flush, black bakelite case; 2.75" x 2.88" body, 1.46" d behind fl, 3" x 3.125" x 3/16" fl; 2% accuracy for full-scale reading; calibrated for 3/32" thk steel panel; 50 scale divisions, black markings on white background, window in top of case for illumination; self-contained; 2 mtg lugs fastened on bottom of case, two 8-32 NC-2 x 1-1/4" screws; 2 screw type term. 1/4"-28 NF-2, 3/4" lg; Weston model 731.	V505 and V506 plate current.	3F1008-22
M503, M504	METER, ammeter: thermo r-f; range 10 r-f amp; rectangular, black phenolic flush mtg case; 2.75" x 2.88" body, 1.46" d behind fl, 3" x 3.13" x 3/16" fl; 2% accuracy up to 65 mc; power consumption .2 - .4 w per amp from 1 - 4 amp, .15 w per amp for 5 amp and above; calibrated for nonmagnetic panel; 50 scale divisions, black markings on white background, window in top of case for illumination; self-containing; 2 mtg lugs fastened on bottom of case, two 8-32 NC-2 x 1-1/4" screws; two screw type term. 1/4"-28 NF-2, 3/4" lg; Weston model 733.	R-f line current.	3F1010-53
Z513, Z514	METER, voltmeter: (less meter) LV vacuum; 1 fixed mica capacitor, 1 vacuum capacitor, 2 fixed resistors and 1 tube socket on grid meter chas-	Power amplifier grid RF peak reading voltmeter.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	sis; metal chassis; 6 uuf and .0047 uf capacitors, 10,000 ohm 1 w and 270,000 ohm 2 w resistors; rectangular; 9" lg x 4-1/4" wd x 3-1/2" h o/a; Collins Rad part/dwg #504 2302 004.		
Z515, Z516	METER, voltmeter: (less meter) HV vacuum; 1 fixed mica capacitor, 1 fixed ceramic capacitor, 1 variable and 1 vacuum capacitor, 2 fixed resistors and 1 tube socket on chassis; metal chassis; 4700 uuf, 51 uuf, 6 uuf and 100 uuf capacitors, 10,000 ohm 1 w, 390,000 ohm 2 w resistors; rectangular; 9-1/4" lg x 3-3/8" wd x 7-1/2" h o/a; Collins Rad part/dwg #504 2305 004.	Power amplifier plate RF peak reading voltmeter.	
M505, M506, M507	METER, ammeter: d-c; range 0 - 1 ma; rectangular, flush, black bakelite case; 2.75" x 2.88" body, 1.46" d behind fl, 3" x 3.13" x 3/16" fl; 2% accuracy for full-scale reading; 55-ohm res; calibrated for 3/32" thk steel panel; 50 scale divisions, black markings on white background window in top of case for illumination; self-contained; 2 mtg lugs fastened on bottom of case, two 8-32 NC-2 x 1-1/4" screws; 2 screw type term. 1/4"-28 NF-2, 3/4" lg; scale marked 0 - 100; Weston model 731.	M505: Exciter multimeter A. M506: Exciter multimeter B. M507: Power amplifier multimeter.	3F891-95
B501B	MOTOR, AC: ind type; 3/4 hp, 1450/1750 rpm; closed frame; 40°C temp rise, continuous duty cyc; w/o pulley, shaft w/3/16" x 3/32" keyway; 10-7/8" lg x 8" dia body, 9-3/4" wd incl term. strip knockout box, .750 dia shaft protrudes 2-1/4" from side of frame; 208/220 v a-c, 3 ph, 50/60 cps, 3 amp RMS input; Peerless Elec Prod frame #PW66B; fixed mtg base; four 3/8" x 1" cored slots spaced on 5-5/16" x 5" mtg/c; drip proof ball bearings; Peerless Elec Prod frame #PW66B; Collins Rad part/dwg #230 0187 00.	Power blower.	3H3000A75-8
B502	MOTOR, AC: Navy type -211454; series, low inertia, servo motor, squirrel case ind; 2400 rpm; closed frame, 2-pole; 65°C temp rise over 55°C ambient; flatted shaft one end other end w/.236" dia x 9/16" lg w #6-40 NF-2 thk x .150" lg and taper .250" lg; .187" dia x 5/8" lg shaft, protrudes 7/16" from side of frame, 4" lg x 2-5/8" wd x 3-3/16" h o/a; face mtg; four .206" dia mtg holes spaced 90° on 1-5/8" rad; term. board on top w/4 term. Diehl type #FPE 49-7; Collins Rad part/dwg #230 0122 00.	Servo drive motor for r-f unit.	3H3000-178

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
B701(A)	MOTOR, AC: low inertia control type; 3200 rpm no load, output 5 w; closed frame, 2-pole; temp rise 65°C over 55°C ambient, max; pulley not incl, flatted shaft; 3-1/8" lg x 2-3/8" wd x 2-13/16" h o/a; shaft 5/32" dia protrudes 15/32" from frame one end, 3/8" other end; 115 v a-c, 60 cps, 2 ph; horiz mtg; 4 holes on 1-1/2" x 1.920" mtg/c; ball bearings; Collins Rad part/dwg #503 8632 002.	Servo drive motor for Z507 and Z508.	3H3000-176
B701(B)	MOTOR, AC: Navy type #-212037; squirrel cage ind type; 1400 to 2900 rpm; closed frame, 2-pole; 55°C temp rise; flatted shaft; 4" lg x 2-5/8" wd x 3-3/16" h excluding shaft, 3/16" dia shaft protruding 15/32" and 9/16" from side of frame; 115/115 mv, 2 ph, 60 cyc, .16 amp per ph; Diehl frame #FPE49, modified by cutting shaft lg; face mtg; four .206" dia mtg holes spaced 90° on 1-5/8" rad; Collins Rad part/dwg #504 1074 002.	Servo drive motor for Z509, Z510, Z511 and Z1510.	3H3000A06-16
O564	PIN, locating: SS type #303; cylindrical; 1-5/8" lg x .1572" OD x .125" ID; Collins Rad part/dwg #506 5956 002.	Mounts O-563.	
O566	PIN, roller: SS type #303; cylindrical; 1-7/16" lg x .125" OD; two .095" dia x .017" wd grooves spaced 1/8" from ea end; Collins Rad part/dwg #506 5953 002.	Mounts O565.	
O567	POST, supporting: SS type #303; cylindrical; 1-5/8" lg x .184" OD; two .147" dia x .028" wd grooves spaced 1-3/8" c to c, 1/8" dia x 1-16" center groove; Collins Rad part/dwg #506 5966 002.	Supports O562.	
Z517	POWER SUPPLY: servo; c/o one pilot light, 1 terminal, 1 connector, 2 transformers, 1 resistor, 1 capacitor, 1 chassis; metal chassis; rectangular; 19" lg x 5" wd x 9-1/4" h; mtd by four slots, two on ea end of flange; Collins Rad part/dwg #505 7608 004.	Servo amplifier power.	
CR801, CR802	RECTIFIER, metallic: Navy type #-20665; selenium; input 130 v a-c, 60 cyc, single ph; output 125 v d-c, 100 ma, halfwave; rectangular 1-1/4" wd x 1-5/32" h x 11/16" d excluding term.; term. or screw mtd; Fed Tele and Rad cat #403D2625.	Input limiters.	3H4956-76
CR501	RECTIFIER, metallic: selenium; nom input 140 v a-c, single ph, 60 cyc; nom output 108 v d-c, 600 ma at 45°C; cylindrical, 5-27/32" lg x 1-3/4" wd x 2-1/2" h o/a; fl mtd by four 13/64" lg x 9/64" wd slots, 2 on each end spaced 1-5/32" c to c; 6 solder lug type term.; Fansteel Metallur #BD074T.	115-volt d-c supply.	
CR502, CR1502, CR1503	RECTIFIER, metallic: selenium; input 130 v a-c single ph; output 380 v d-c inverse, halfwave; sq 1-17/32" lg x 1-17/32" wd x 1" d; accom #6 ma-	115-volt d-c supply.	3H4860-223

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	chine screw, solder lug term.; miniature, 2000 ma peak cur, 550 ma RMS cur, 200 ma d-c output; Fed Tele and Rad type #1006A.		
K501	RELAY, armature: cont arrangement left 1C, right 1B; cont rating 1C, 1 amp at 150 v d-c inductive, 1B, 1 amp at 230 v d-c resistive; palladium cont; single wnd. 132 v d-c max oper v, 3600-ohm ±10% d-c res, ins coil; solder lug term.; 4" lg x 1-15/32" wd x 1-13/32" h o/a; two #5-32 NC-2 mtg holes on top spaced .625" c to c, two #8-32 NC-2 mtg holes on one end spaced .750" c to c; Clare CP type E.	Controls tuning voltages.	2Z7599A-530
K502	RELAY, armature: cont arrangement left 1A; cont rating 1 amp at 150 v d-c inductive; palladium cont; single wnd, 132 v d-c max oper v, 3000-ohm ±10% d-c res, ins coil; solder lug term.; 4" lg x 1-15/32" wd x 1-13/32" h o/a; two #6-32 NC-2 mtg holes on top spaced .625" c to c, two #8-32 NC-2 mtg holes on one end spaced .750" c to c; slow acting, release time .3 - .4 sec; Clare CP type E.	Starts tuning control sequence.	2Z7599A-531
K503	RELAY, armature: cont arrangement left 1A, right 1A, 1B; cont rating 1 amp at 150 v d-c inductive; palladium cont; single wnd, 110 v d-c max oper v, 2500-ohm ±25% at +20°C res, ins coil; solder lug term.; .4" lg x 1-15/32" wd x 1-13/32" h o/a; two #6-32 NC-2 mtg holes on top spaced .625" c to c, two #8-32 NC-2 mtg holes on one end spaced .750" c to c; slow acting, release time. .3 - .4 sec; Clare CP type E.	Sequences servo tuning system.	2Z7599A-532
K504	RELAY, armature: cont arrangement left 1A, right 1C; cont rating 1A, 1 amp at 150 v d-c inductive, 1C, 1 amp at 220 v d-c resistive; palladium cont; single wnd, 132 v d-c max oper v, 3000-ohm ±10% d-c res, ins coil; solder lug term.; 4" lg x 1-15/32" wd x 1-13/32" h o/a; two #6-32 NC-2 mtg holes on top spaced .625" c to c, two #8-32 NC-2 mtg holes on one end spaced .750" c to c; slow acting, release time .3 - .4 sec; Clare CP type E.	Removes transmitter excitation.	2Z7599A-533
K505	RELAY, armature: cont arrangement left 2A, right 2C; cont rating 1 amp at 150 v d-c inductive; palladium cont; single wnd, 132 v d-c max oper v, 3600 ohm ±10% d-c res, ins coil; solder lug term.; 4" lg x 1-15/32" wd x 1-13/32" h o/a; two #6-32 NC-2 mtg holes on top spaced .625" c to c, two #8-32 NC-2 mtg hole on one end spaced .750" c to c; Clare CP type E.	Controls prepositioning voltage.	2Z7599A-535
K507	RELAY, armature: cont arrangement left 1A, 1C; cont rating 1 amp at 150 v d-c inductive; palladi-	Sequences nonservo tuning system.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	um cont; single wnd, 132 v d-c max oper v, 3600-ohm +10% d-c res, ins coil; solder lug term.; 4" lg x 1-15/32" wd x 1-13/32" h o/a; two #6-32 NC-2 mtg holes on top spaced .625" c to c, two #8-32 NC-2 mtg holes on one end spaced .750" c to c; Clare CP type E.		
K801, K802	RELAY, armature: Navy type #-291786; cont arrangement SPDT, double break; cont rating 8 amp, 24 v d-c; silver pl cont; single wnd, oper cur 9-11 ma, release cur 2.4 ma, 9000-ohm ±10%, non-pol, gnd coil; solder lug term. on coil and cont; 2-1/16" lg x 1-5/8" wd x 1-1/2" h; four 6-32 NC-2 holes on 1-5/16" x 1/2" mtg/c; fast acting; GE type CR2791-B109P36.	Servo motor control.	2Z7599-109
R540, R541, R542, R543, R582, R1575 thru R1578	RESISTOR, fixed: Navy type #634098-20; carborundum; 50-ohm ±20%; 22 w, free air; 5" lg x 5/8" dia; uninsulated; 2 ferrule term. 5/8" dia; Clobar type #CX.	R540: Parasitic suppressor grid V505. R541: Parasitic suppressor grid V506. R542: Parasitic suppressor grid V505. R543: Parasitic suppressor filament V506. R582: V504 plate stabilizer. R1575 thru R1578: Part of parasitic suppressor in Cathode box.	3Z6005-218
R572.1 thru .10, R575.1 thru .10	RESISTOR, fixed: comp; 2200 ohm p/m 10%; lw; characteristic ltr F; .750" lg x .280" dia; ins, humidity and RSW; 2 axial wire lead term; JAN type #RC30BF222K.	R572.1 thru R572.10: Tuning servo limit. R575.1 thru R575.10: Tuning servo limit.	3RC30BF222K
R574.1 thru .10	RESISTOR, fixed: 1500 ohm p/m 10%; 1 w; characteristic ltr F; .750" lg x .280" dia; ins, humidity and RSW; 2 axial wire lead term; JAN type #RC30BF152K.	Z508 tuning servo limit.	3RC30BF152K
R518, R530, R1428	RESISTOR, fixed: comp; JAN type RC30BF470K; 47-ohm ±10%; 1 w.	R518: V502 screen. R530: V503 screen. R1428: V1404 parasitic suppressor grid.	3RC30BF470K
R811, R814	RESISTOR, fixed: comp; JAN type RC30BF101K; 100-ohm ±10%; 1 w.	R811: K801 spark suppressor. R814: K802 spark suppressor.	3RC30BF101K
R527, R616	RESISTOR, fixed: comp; JAN type RC42BF101K; 100-ohm ±10%; 2 w.	R527: V503 plate series. R616: Part of V504 parsitic suppressor circuit grid.	3RC42BF101K
R569	RESISTOR, fixed: comp; JAN type RC42BF151K; 150-ohm ±10%; 2 w.	R569: Keying waveshaper in output of V507.	3RC42BF151K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R612	RESISTOR, fixed: comp; JAN RC42BF221K; 220-ohm ±10%; 2 w.	R612: Z806 servo limit.	3RC42BF221K
R501, R502, R503, R504	RESISTOR, fixed: comp; JAN type RC42BF331K; 330-ohm ±10% 2 w.	Input line load.	3RC42BF331K
R557	RESISTOR, fixed: comp; JAN type RC30BF471K; 470-ohm ±10%; 1 w.	V507 cathode.	3RC30BF471K
R528	RESISTOR, fixed: comp; JAN RC42BF222K; 2200-ohm ±10%; 2 w.	Driver neutralizing series.	3RC42BF222K
R651.1 thru R651.10, R652.1 thru R652.10, R653.1 thru R653.10, R654.1 thru R654.10, R655.1 thru R655.10, R666.1 thru R666.10	RESISTOR, variable: 10,000 ohms ±5%; 2 w solder lug term.; 3/4" dia x 1-3/8" lg; round shaft, .125" dia x 11/16" lg FMS; lin taper; bushing 1/4"-32 NEF-2 x 5/8" lg; Collins Rad part/dwg #377 0230 00.	R651.1 thru R651.10: Z501 servo panel resistor. R652.1 thru R652.10: Z502 servo panel resistor. R653.1 thru R653.10: Z503 servo panel resistor. R654.1 thru R654.10: Z504 servo panel resistor. R655.1 thru R655.10: Z505 servo panel resistor. R666.1 thru R666.10: Z506 servo panel resistor.	3Z7410-241
R1311, R1324	RESISTOR, fixed: comp; JAN type RC30BF103K; 10,000-ohm ±10%; 1 w.	Output V dividers.	3RC30BF103K
R597 thru R601	RESISTOR, fixed: comp; JAN RC42BF123K; 12,000-ohm ±10%; 2 w.	Test keying dividers.	3RC42BF123K
R577	RESISTOR, fixed: comp; JAN type RC30BF273K; 27,000-ohm ±10%; 1 w.	Test keying divider.	3RC30BF273K
R509 thru R511, R523	RESISTOR, fixed: comp; JAN RC42BF333K; 33,000-ohm ±10%; 2 w.	R509, R510, R511: V501 screen dividers. R523: V503 bias divider.	3RC42BF333K
R610, R611	RESISTOR, fixed: comp; JAN type RC42BF473K; 47,000-ohm ±10%; 2 w.	Test keying dividers.	3RC42BF473K
R816, R817	RESISTOR, fixed: comp; JAN type RC30BF823K; 82,000-ohm ±10%; 1 w.	R816: I 801 series resistor. R817: I 802 series resistor.	3RC30BF823K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R522	RESISTOR, variable: comp; 50,000-ohm ±20%; 3 solder lug term.; plastic metal case w/cover 1-1/16" dia x 9/16" d, encl case, sliding brush type; slotted shaft, metal, 1/4" dia x 7/8" lg FMS; lin taper; cont arm ins, w/o off position; bushing 3/8"-32 x 1/2" lg, nonturn device located on 17/32" rad at 9 o'clock. AB #JL 21818.	V503 bias divider variable.	3Z7450-157
R602, R603	RESISTOR, fixed: comp; JAN RC42BF563K; 56,000-ohm ±10%; 2 w.	Test keying dividers.	3RC42BF563K
R606, R607	RESISTOR, fixed: comp; JAN type RC42BF683K; 68,000-ohm ±10%; 2 w.	Test keying dividers.	3RC42BF683K
R550, R556, R617, R803, R804	RESISTOR, fixed: comp; JAN type RC30BF104K; 100,000-ohm ±10%; 1 w.	R550, R556: V507 grid series. R617: Monitor divider. R803, R804: V801 grid series.	3RC30BF104K
R629	RESISTOR, fixed: comp; 470,000 ohm p/m 10%; lw; characteristic ltr F; .750" lg x .280" dia; ins, humidity and RSW; 2 axial wire lead term; JAN type RC30BF474K.	Key line input termination resistor.	3RC30BF474K
R549, R604	RESISTOR, fixed: comp; JAN type RC42BF104K; .10 meg ±10%; 2 w.	R549: V507 grid leak. R604: Test keying divider.	3RC42BF104K
R605	RESISTOR, fixed: comp; JAN RC42BF124K; .12 meg ±10%; 2 w.	Test keying divider.	3RC42BF124K
R517	RESISTOR, fixed: comp; JAN type RC42BF154K; .15 meg ±10%; 2 w.	V502 screen.	3RC42BF154K
R1323	RESISTOR, fixed: comp; JAN type RC42BF274J; .27 meg ±5%; 2 w.	Output V divider.	3RC42BF274J
R1301	RESISTOR, fixed: comp; JAN type RC42BE394J; .33 meg ±5%; 2 w.	Output V divider.	3RC42BE394J
R814, R815	RESISTOR, fixed: comp; JAN type RC30BF334K; .33 meg ±10%; 1 w.	Feedback series.	3RC30BF334K
R631 thru R641, R642	RESISTOR, fixed: comp; JAN type RC30BF105K; 1 meg ±10%; 1 w.	V508 grid voltage dividers.	3RC30BF105K
R625	RESISTOR, fixed: comp; JAN type RC30BF105K; 1 megohm ±10%; 1 w. .	V508 grid leak.	3RC30BF105K
R544, R545	RESISTOR, fixed: WW; .2 ohm ±1%; 12 w at 275°C max continuous oper temp; 2" lg x 19/32" dia o/a; vitreous coating, RSW; 2 tab term. 37/64" lg x 17/64" wd; WL type #M-32.	R544: V505 cathode meter shunt. R545: V506 cathode meter shunt.	3Z5992-81

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R565	RESISTOR, fixed: WW; 1 ohm ±1%; 12 w at 275°C max continuous oper temp; 2" lg x 19/32" dia o/a; vitreous coating, RSW; 2 radial tab term. 37/64" lg x 17/64" wd; WL type #M-32.	Power amplifier total grid meter shunt.	3Z5991-121
R564, R566	RESISTOR, fixed: WW, noninductive; JAN type RB12B2R000F; 2-ohm ±1%; 1/2 w at 85°C max continuous oper temp.	R564: V505 grid meter shunt. R566: V506 grid meter shunt.	3RB2-2000.1
R529	RESISTOR, fixed: WW, noninductive; MIL type RB17K5R030F; 5.030 ohm ±1%; 1/2 w at 85°C max continuous oper temp.	V503 cathode meter shunt.	3RB2-5030
R508, R516	RESISTOR, fixed: WW, noninductive; MIL #RB17K10R10F;10.10-ohm ±1%; 1/2 w.	R508: V501 cathode meter shunt. R516: V502 cathode meter shunt.	3RB3-1010
R534	RESISTOR, fixed: WW, noninductive; type RD17K20R40F; 20.40-ohm ±1%; 1/2 w at 85°C max continuous oper temp.	V504 grid meter shunt.	3RB3-2040
R586 thru R589	RESISTOR, fixed: WW, noninductive; 75-ohm ±5%; 160 w; 8-5/8" lg x 1-5/16" dia o/a; vitreous enameled, RSW; 2 ferrule term. 1-1/8" dia x 1/2" lg; WL type RFD.	Single sideband loadings.	3Z6007E5-54
R506, R525	RESISTOR, fixed: WW, noninductive; type RB17K111R0F; 111-ohm ±1%; 1/2 w at 85°C max continuous oper temp; 1" lg x 27/32" dia o/a; ceramic encl, fungi resistant 2 radial tab term. 3/8" lg x 3/16" wd.	R506: Buffer and first multiplier grid meter shunt. R525: V503 grid meter shunt.	3RB4-1110
R562, M563, M567	RESISTOR, fixed: WW, noninductive; MIL #RB17K900R0F;900-ohm ±1%; 1/2 w.	R562: M505 multiplier. M563: M506 multiplier. M567: V505 and V506 multimeter series.	3RB4-9000.3
R531	RESISTOR, fixed: WW; JAN type RW16F202; 2000-ohm ±5%; 14 w at 275°C max continuous oper temp.	V503 plate series.	3RW26106
R537	RESISTOR, fixed: WW; JAN type RW13F312; 3100-ohm ±5%; 50 w at 275°C max continuous oper temp.	V504 screen.	3RW27302
R520	RESISTOR, fixed: JAN type RW14F402; 4000-ohm ±5%; 40 w at 275°C max continuous oper temp.	V502 plate dropping.	3RW27903
R801, R806, R807	RESISTOR, fixed: comp; JAN type RC30BF472K; 4700-ohm ±10%; 1 w.	R801: Input limiting. R806, R807: Voltage divider.	3RC30BF472K
R553, R614	RESISTOR, fixed: JAN type RW13F502; 5000-ohm ±5%; 50 w at 275°C max continuous oper temp.	V507 bias dividers.	3RW28505

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R578	RESISTOR, fixed: WW; JAN type RW13F632; 6300-ohm ±5%; 50 w at 275°C max continuous oper temp.	Oscillator series dropping.	3RW29102
R512, R521	RESISTOR, fixed: JAN type RW14F802; 8000-ohm ±5%; 40 w at 275°C max continuous oper temp.	R512: V501 plate divider. R521: V502 and V503 screen divider.	3RW29704
R559	RESISTOR, fixed: WW; JAN type RW13F802; 8000-ohm ±5%; 50 w at 275°C max continuous oper temp.	V507 output divider.	3RW29703
R535	RESISTOR, fixed: WW; JAN type RW14F103; 10,000 ohms ±5%; 40 w at 275°C max continuous oper temp.	V504 bias divider.	3RW30304
R513	RESISTOR, fixed: WW; JAN type RW14F123; 12,000 ohms ±5%; 40 w at 275°C max continuous oper temp.	V501 plate divider.	3RW30903
R532, R558, R561	RESISTOR, fixed: WW; JAN type RW13F163; 16,000 ohms ±5%; 50 w at 275°C max continuous oper temp.	R532: V504 bias divider. R558: V507 plate load. R561: V507 output divider.	3KW31502
R552, R555	RESISTOR, fixed: WW; JAN type RW13F203; 20,000 ohms ±5%; 50 w at 275°C max continuous oper temp.	R552: V507 plate load. R555: V507 bias divider.	3KW32104
R657.1 thru .10	RESISTOR, fixed: WW; 1.25 ohm p/m 3%; 2 w at 275°C max continuous oper temp; 1/4" dia x 3/4" lg max; silicone coated, RSW; two axial wire lead term, 1-1/4" lg ea end; power type resistor characteristic ltr F; Dale Products type RS-2.	Illumination light series.	
R809, R810	RESISTOR, fixed: comp; JAN type RC30BF225K; 2.2 meg ±10%; 1 w.	R809: V802 bias. R810: V802 bias.	3RC30BF22SK
R805	RESISTOR, variable: comp; 5,000 ohms ±20%; 2 w min at 70°C; 3 solder lug term; 1-5/32" dia x 19/32" d max, encl; round slotted shaft; w/o off position; bushing 3/8"-32 NEF-2 x 1/2" lg, non-turn-device located on 17/32" rad at 9 o'clock; AB type U to Collins Rad spec #380 5755 00.	Sensitivity control.	3Z7350-108
R813	RESISTOR, variable: comp; 500,000 ohm p/m 20%; 2 w min at 70°C; 3 solder lug term; metal cover w/phenolic base 1-5/32" dia x 19/32" d max; round slotted shaft; metal; 1/4" dia x 5/8" lg FMS; lin taper; ins cont arm, w/o off position; normal torque bushing slotted for shaft lock nut; bushing 3/8"-32 NEF-2 x 1/2" lg non-turn-device located on 17/32" rad at 9 o'clock; fungi resistant; AB type U.	Motor anti hunt control.	3Z7498-50.121
R548	RESISTOR, variable: comp; 25,000 ohms ±20%; 1 w min at 85°C continuous oper temp; 3 solder lug term; plastic metal case 1-1/16" diam x 9/16" d, encl case, sliding brush type; slotted shaft, metal, 1/4" dia x 7/8" lg from mtg surface; w/o off posi-	Keying input level control.	3Z7425-100

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	tion; bushing 3/8"-32 x 1/2" lg, non-turn device located on 17/32" rad at 9 o'clock. AB #JL 20888.		
R536, R701	RESISTOR, variable: 5000 ohms ±5%; 2 w; two solder lug term; phenolic case 1-49/64" dia x 2-1/8" d max, round shaft; w/o off position 3600 deg rotation required for max resistors; bushing 3/8"-32 x 3/8" lg, non-turn device located on 17/32" rad at 3 o'clock; Gibbs to Collins Rad Spec #377 0023 00.	R536, R701: Servo positioning pots (motor driven by B502).	3Z7350-159
R560	RESISTOR, variable: JAN type RA25A1SA502AK; 5000 ohms ±10%; 3 w, at 100°C continuous oper temp.	V507 output adjustment.	3RA6942
R554	RESISTOR, variable: WW; JAN type RA25A1-SA502AK; 5000 ohms ±10%; 3 w, at 1000°C continuous oper temp.	V507 bias divider.	3RA6908
R570, R573	RESISTOR, variable: WW; JAN type RA25A1-SA103AK; 10,000 ohms ±10%; 3 w, at 100°C continuous oper temp.	R570: Test keying divider. R573: Test keying divider adjustment.	3RA7504
R568	RESISTOR, variable: 25,000 ohms ±10%; 7 w; at 100°C continuous oper temp.	Test keying input pot.	3Z7425-143
R519	RESISTOR, variable: WW; JAN type RP151FE-103KK; 10,000 ohms ±10%; 50 w, at 340°C continuous oper temp; 3 solder lug term.	Excitation control screen grids V502 and V503.	3RB9306
R808	RESISTOR, fixed: comp; 33,000 ohms ±10%; 1 w; JAN type RC30BF333K.	V801 grid series.	3RC30BF333K
R526, R571	RESISTOR, fixed: comp; 20 ohms ±5%; 2 w; JAN type RC42BF200J.	R526: V503 grid. R571: V503 bias divider.	3RC42BF200J
R551	RESISTOR, fixed: comp; 680 ohms ±10%; 1 w; JAN type RC30BF681K.	V507 cathode.	3RC30BF681K
R618	RESISTOR, fixed: comp; 1000 ohms ±10%; 1 w; JAN type RC30BF102K.	Monitor divider.	3RC30BF102K
R524	RESISTOR, fixed: comp; 1000 ohms ±10%; 2 w; JAN type RC42BE102K.	V503 grid.	3RC42BE102K
R505, R514	RESISTOR, fixed: comp; 22,000 ohms ±10%; 1 w; JAN type RC30BF223K.	R505: V501 grid. R514: V502 grid.	3RC30BF223K
R608, R609	RESISTOR, fixed: comp; 22,000 ohms ±10%; 2 w; JAN type RC42BF223K.	Keying dividers.	3RC42BF223K
R507, R515, R533, R615,	RESISTOR, fixed: comp; 470 ohms ±10%; 2 w; JAN type RC42BF471K.	R507: V501 cathode. R515: V502 cathode. R533: V504 grid. R615: Z804 limit.	3RC42BF471K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R619 thru R622		R619 thru R622: Meter light series.	
R579, R580, R630	RESISTOR, fixed: comp; .18 meg ±10%; 1 w; JAN type RC30BF184K.	R579: I 502 voltage dropping. R580: I 503 voltage dropping. R630: I 504 series.	3RC30BF184K
R538, R539	RESISTOR, fixed: WW; 800 ohms ±5%; 140 w; JAN type RW10G801.	R538: V506 grid. R539: V505 grid.	
R581, R613	RESISTOR, fixed: WW; 1600 ohms ±5%; 40 w; JAN type RW14G162.	R581: Filter resistor for V507 output. R613: Filter and decoupling in V507 output.	3RW25554
R576, R583, R584, R585, R590	RESISTOR, fixed: WW; 3100 ohms ±5%; 14 w; JAN type RW16G312.	R576: I 507 voltage dropping. R583: I 505 voltage dropping. R584: I 512 voltage dropping. R585: I 506 voltage dropping. R590: I 501 voltage dropping.	3RW27352
O565	ROLLER, support: free machine brass, ternary pl (copper tin and zinc); cylindrical; .995" lg x .437" OD; .128" ID for mtg; Collins Rad part/dwg #506 5954 002.	Operates shorting contact E647.	
S505A, S506A	ROTOR, switch: silver pl brass; fan shaped; 2" lg radius x 60° single .252" dia mtg hole; two #6-40 tapped holes in hub 90° apart; N/A Collins Rad part/dwg #504 2078 002.	S505A: Part of S505. S506A: Part of S506.	3Z7585-5
E654	SCREW, machine: Phillips drive; recessed pan head, cold headed; brass, nickel pl; #8-32NC-2; 3/4" lg; threaded to head; .322" dia x .115" thk; Collins Rad part/dwg #343 0313 00.	Cabinet ground.	
O709	SHAFT, gear: SS type #303; cylindrical; 1.156" lg x 1.550" OD o/a; undercut to .125" dia on ea end for .109"; Collins Rad part/dwg #503 8612 002.	Support O 705.	
E699.1	SHIELD, tube: cad pl steel; cylindrical w/1/2" dia hole in top; bayonet; 1-3/8" lg x .915" max ID, .810" min ID; w/ss spring inside; Johnson EF #278A.	Used on V-508.	
E806, E807	SHIELD, electron tube: cylindrical; bayonet mtg; .950" ID x 1-15/16" lg; Cinch #16G12627.	E806: Hold-down shield for V-802. E807: Hold-down shield for V-801.	2Z8304.137

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
K506	SOLENOID: rotary solenoid w/300 ratchet, detent assem and 1 switch sect.; spring silver alloy cont and coil silver alloy rotor blades, steatite sw sect., other parts metal; nom vdcw 115, coil resistance 75 ohms ±10%; 20 sec ON, 200 sec OFF duty cycle, shorting type sw section; 2-7/8" lg x 1-3/4" wd x 1-7/8" h o/a; three .166" dia mtg holes spaced on 1-3/4" x 1-3/4" mtg/c; fungi resistant ins; Leland Elec, type 5.	Intermediate power amplifier antenna network shorting.	2Z8802-36
L701	SOLENOID: pull type; metal body; coil data 117v 60 cps AC nom, 130v 60 cps AC max, coil resistance 300 ohm p/m 10% at plus 20°C, 170 ma 60 cps nom oper cur; 85°C max temp rise, intermittent duty, 5 min ON, 15 min OFF at an ambient temp of plus 24°C; cylindrical; 1-3/4" lg x 15/16" dia; two #8-32NC-2 tapped holes spaced 1-1/32" c to c; Guardian Elec #1A AC (Modified).	Operates motor brake.	
XV501	SOCKET, tube: Navy type #-49367; octal; under chassis wafer mtg; two 17/64" x 11/64" mtg holes on 1-49/64" mtg/c; oval ceramic body, 2-5/16" lg x 1-11/16" wd x 7/32" h excluding term.; phosphor bronze cad pl cont; Johnson EF catalog #228.	Mounts V501.	2Z8678.29
XV502, XV503, XV1404	SOCKET, tube: Navy type #49363; 5 cont small; under chassis wafer mtg; two 11/64" x 17/64" mtg holes spaced 1-49/64" c to c; oval ceramic body, 2-5/16" lg x 1-11/16" wd x 1/4" h excluding term.; phosphor bronze cad pl cont; Johnson EF catalog #225.	XV502: Mounts V502. XV503: Mounts V503. XV1404: Mounts V1404.	2Z8763
XV504	SOCKET, tube: Navy type #-491975; 5 prongs giant; above chassis mtg; four .190" dia mtg holes on 2.250" x 2.250" mtg/c; sq ceramic body, 2-7/8" lg x 2-7/8" wd x 9/32" h excluding term.; brass cad pl cont; Johnson EF catalog #275.	Mounts V504.	2Z8675.110
XV507, XV801, XV802	SOCKET, tube: Navy type #492009; 9 cont minature; 1 piece saddle mtg 1-11/32" lg; two .125" dia holes on 1.125" mtg/c; round ceramic body .940" dia x 11/16" h, less cont incl shield; beryllium copper silver pl cont; incl metal shield; Cinch #53F12776.	XV507: Mounts V507. XV801: Mounts XV801. XV802: Mounts XV802.	2Z8679.57
XV508	SOCKET, tube: 7 cont minature; JAN type SO10M; above chassis base mtg; w/3/4" h metal shock shield, ctr shield .095" ID.	Mounts V508.	2Z8677.94
XV1301, XV1303	SOCKET, tube: 7 cont miniature; below chassis base mtg; two .125" dia mtg holes .875" c to c; round ceramic body 13/16" dia x 11/32" lg excluding term.; brass cad pl cont; Amphenol #147-501.	XV1301: Mounts V1301. XV1303: Mounts V1303.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
L516F, L517F	SPRING: flat type; cur carrying cont u/w shorting bar; #28 ga silver pl beryllium copper; 1-13/64" lg x 25/32" wd x 5/8" h o/a; two .140" dia holes on .312" mtg/c; Collins Rad part/dwg #504 1485 001.	L516F: Part of V505 plate tank coil. L517F: Part of V506 plate tank coil.	2Z8877.366
L516G, L517G, L518F, L519F	SPRING: flat type; current carrying contact u/w shorting bar; #26 ga silver pl beryllium copper; 1-3/16" lg x 1/4" wd x 29/64" h o/a; two .140" dia holes on .281" mtg/c; Collins Rad part/dwg #504 1484 001.	L516G: Part of V505 plate tank coil. L517G: Part of V506 plate tank coil. L518F: Part of left antenna coupling coil. L519F: Part of right antenna coupling coil.	2Z8877.367
O 562	SPRING: extension type; return; .050" dia beryllium copper wire, ternary pl (copper, tin, and zinc); 2-5/8" lg x 3/8" dia o/a; 37 turns; Collins Rad part/dwg #506 5965 002.	Opens C571 shorting assembly.	
O701(E), O701(G)	SPROCKET: silent chain use; SS type 303; 19 teeth, 3/16 pitch, 1.139" pitch dia; 2-5/16" OD, 3/4" o/a lg; 1/4" bore; hub extends .612" beyond face of gear, 9/16" OD; Collins Rad part/dwg #503 9099 002.	Output couplings for motor on Z510.	2Z8880-11
O 512	SPROCKET, chain: u/w Link Belt silent chain S1807; 19 teeth, 3/16" pitch, PD 1.139", .138" face wd; hub 7/8" dia x .331" thk; 1-1/4" dia x .469" thk o/a .625" dia hole through center; Collins Rad part/dwg #504 1921 002.	Idler in antenna platform drive assembly.	2Z8880-17
O 520	SPROCKET, chain: u/w Link Belt silent chain D1810; SS type #303; 110 teeth, diametral pitch 3/16", PD 6.566", face .375" wd; round, solid, hub .687" lg, .812" OD; 6-11/16" dia x 1.062" lg o/a; .5905" dia shaft hole; face of sprocket has ctr groove .155" lg; Collins Rad part/dwg #504 3286 003.	Drives shorting bar for L516.	2Z8880-16
O521	SPROCKET, chain: u/w Link Belt silent chain #D1810; SS type #303; 55 teeth, diametral pitch 3/16", PD 2.284", width of face .375", groove in face .155" wd; round, OD of hub .812", .937" lg; 3.409" dia x 1.312" lg; .590" dia shaft hole; Collins Rad part/dwg #504 3279 002.	Drives R536.	2Z8880-14
O 522	SPROCKET, chain: u/w Link Belt silent chain #D-1810; SS type #303; 110 teeth, diametral pitch 3/16", PD 6.566", face .375" wd; round, solid, hub .812" OD x .797" lg; 6-11/16" dia x .952" lg; .590" dia shaft hole; Collins Rad part/dwg #504 3287 003.	Drives shorting bar for L517.	2Z8880-15
O 523	SPROCKET, chain: u/w Link Belt silent chain #ACD-1810, 5/16" wd; SS type #303; 20 teeth, diametral pitch 3/16", PD 1.198, pitch duplex type	Drives C569.	2Z8880-18

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	for inside cont, face .155" wd; round, hub .812" OD, 1.172" lg; 1.323" dia x 1.327" lg o/a; .590" dia hold through ctr; Collins Rad part/dwg #504 3262 001.		
O 524	SPROCKET, chain: u/w Link Belt silent chain #ACD-1810, 5/16" wd; SS type #303; 20 teeth, diametral pitch 3/16", PD 1.198", pitch duplex type for inside cont, face .155" wd; round, hub .812" OD, .470" lg; 1.323" dia x .625" lg o/a; .590" dia hole through ctr; Collins Rad part/dwg #504 3261 001.	Drives O 519.	2Z8880-13
O 528	SPROCKET, chain: u/w Link Belt silent chain #ACD-1810, 5/16" wd; SS type #303; 20 teeth, diametral pitch 3/16", PD 1.198", face .155" wd, pitch duplex type for inside cont; round, hub .812" OD, .860" lg; 1.323" dia x 1.015" lg o/a; .590" dia hole through ctr; Collins Rad part/dwg #504 3263 001.	Drive chain idler sprocket.	2Z8880-34
E517, E518, E519, E653	STUD: brass, cad pl; 1-1/2" lg; 1/4"-20 NC-2 thd entire length; Collins Rad part/dwg #312 0261 00.	E517, E518 and E519: Ground stud T-225/RF Unit. E653: Cabinet ground.	
E649, E650, E650.1, E650.2	STUD: brass, cad pl; 5/8" lg o/a; .164" dia, #8-32AS-2 thd entire length; Collins Rad part/dwg #312 3120 00.	E649: Frequency Multi chassis ground. E650, E650.1, E650.2: Stud.	
E520, E521, E522	SUPPRESSOR, parasitic: resistor and coil type; 1-13/32" lg x 15/32" OD; 5 turns #16 AWG wire, 47 ohms ±10%; 2 w resistor; uncased; 2 axial wire lead term; Collins Rad part/dwg #504 1267 002.	E520: Parasitic suppressor grid V502. E521: Parasitic suppressor grid V503. E522: Parasitic suppressor grid V504.	3Z1891A-23
E523, E524	SUPPRESSOR, parasitic: resistor and coil type; 5" lg x 3/4" wd x 1-1/4" thk o/a; 2 turns #14 AWG tinned copper wire, 50 ohms ±20%, 22 w resistor; uncased; 2 screw ter., 1 ea end; Collins Rad part/dwg #504 2114 001.	Parasitic suppressors in power amplifier.	3Z1891A-23.1
S521	SWITCH, lever: 2 position; 10 amp, 110 v a-c; 3-29/32" lg x 1-1/4" wd x 1-3/4" h; Collins #503 8397 002.	Local test key.	3Z9580-30.31
S520	SWITCH, push: 40 amp 110 v, 20 amp 200 v, 13 amp 440 v; 3-9/16" lg x 2" wd x 1-3/4" h; C-H Bulletin #10250H; Collins #260 0352 00.	H-voltage off.	3Z9824-50.17
S519	SWITCH, push: 40 amp 110 v, 20 amp 220 v, 13 amp 440 v; Collins #260 0355 00.	H-voltage on.	3Z9824-50.16

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
S514A thru S517A	SWITCH, push pull: Navy type #-24067; male cont; bakelite body; 1-7/8" lg x 11/16" wd x 5/8" h o/a; momentary action; screw term; 2 mtg holes 5/32" diam on 1-1/4" mtg/c; Collins Rad part/dwg #260 4040 00.	S514A: Part of door interlock S514. S515A: Part of door interlock S515. S516A: Part of door interlock S516. S517A: Part of door interlock S517.	
S514B thru S517B	SWITCH, push pull: 2 female cont; 2-5/16" lg x 15/16" wd x 5/8" d; GE #746 0330-G-5.	S514B: Part of door interlock S514. S515B: Part of door interlock S515. S516B: Part of door interlock S516. S517B: Part of door interlock S517.	3Z9560-7
S503ABCD	SWITCH, rotary: 6 pole, 5 position; 2 deck 7-1/2 amp, 115 v, 60 cyc; Collins #259 0303 00.	Exciter multimeter.	3Z9825-58.204
S510	SWITCH, toggle: DPST; 3-11/16" lg x 1-25/32" wd x 1-27/32" d; Collins #360 0803 00.	Emergency shut-down and filament on-off.	3Z9858-3.4
S525.1 thru .10	SWITCH, toggle: single pole, 4 position; 10 amp, 15 v DC, 7 amp 30 v DC, 10 amp 125 v AC, 25 amp continuous duty; term silver pl, plate and housing cad or zinc pl steel, handle nickel pl; 2-1/8" h x 1-3/8" wd x 1-1/4" lg max excluding handle; bat handle 7/8" lg; screw term; two #6-32 lock nuts spaced 1.812" c to c in mtg plates; Cutler-Hammer type 8747.	IPA capacitor short.	
S501A thru S501D	SWITCH, rotary: 6 pole 3 position; 2 decks; 7-1/2 amp at 115 v, 60 cyc; solid silver cont; steatite stator and rotor; 2-13/16" lg x 1-7/8" wd x 2-9/16" o/a; nonshorting cont; solder lug term.; single hole mtg, bushing 3/8-32 NS-2 x 3/8" lg, shaft 1/4" dia x 7/8" lg from mtg surface; Collins Rad part/dwg #259 0311 00.	Keying selectors.	3Z9825-50.14
S502A thru S502D	SWITCH, rotary: 6 pole 4 position; 2 decks; 7-1/2 amp at 115 v, 60 cyc; solid silver cont; steatite stator and rotor; 2-13/16" lg x 1-7/8" wd x 2-9/16" h o/a; nonshorting cont; solder lug term.; single hole mtg, bushing 3/8-32 NS-2 x 3/8" lg, shaft 1/4" dia x 7/8" lg from mtg surface; Collins Rad part/dwg #259 0630 00.	Keying input.	
S504	SWITCH, rotary: 3 pole 5 position; 7-1/2 amp at 115 v, 60 cyc; solid silver cont; steatite stator and rotor; 2-13/16" lg x 1-7/8" wd x 1-7/16" h o/a; nonshorting cont; solder lug term.; single hole mtg, bushing 3/8-32 NS-2 x 3/8" lg, shaft 1/4" dia x 7/8" lg from mtg surface; Collins Rad part/dwg #259 0129 00.	Power amplifier multimeter.	3Z9825-8.4

4. **Identification Table of Parts for Radio Transmitter T-454/FRT-26 (contd)**

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
S505, S506	SWITCH, rotary: SPDT; 2 position; silver pl cont; aluminum case; 9-1/8" lg x 5-3/4" wd x 5-1/4" d o/a; shorting type cont; flexible coupling, 9/32" dia shaft; Collins Rad part/dwg #504 2087 004.	R-f line meter shorting.	3Z9825-92.10
S512, S513	SWITCH, rotary: Navy type #-241430; single pole 4 position; 2 decks; 10 amp 125 v; silver pl brass cont; molded phenolic stator and rotor; 2-7/8" OD x 1-7/32" h excluding shaft, shaft 1" lg from mtg surface; shorting type cont; screw term; two 13/64" dia mtg holes on 2.093" mtg/c; Collins Rad part/dwg #260 0815 00.	Power amplifier filament top.	3Z9825-92.14
S524	SWITCH, rotary: 1 pole, 1 circuit; 1 section; spring silver alloy clips cont, coin silver alloy rotor blades; steatite stator; 1-5/16" h x 1-1/4" wd x 1-1/16" lg max; nonshorting cont; solder lug term; single hole mtg, bushing 3/8"-32 NEF-2 x 1/4" lg, .250" diam x 1-1/4" lg shaft FMS flush mtg; w/30° detent; Oak type F.	Channel selector.	
S511	SWITCH, sensitive: Navy type #-241432; SPDT; 5 amp, 250 v a-c; phenolic case; 1-1/16" lg x 13/16" wd x 3/4" h excluding term., shaft w/scdr adj, .062" lg x .115" dia; oper torque 4 gram in.; momentary action; 3 solder lug term.; two .120" dia mtg holes on opposite corners spaced .750" c to c; Micro Sw type V5-14.	Air interlock.	3Z9823-25.2
S518	SWITCH, sensitive: SPDT; JAN type #SS05A10; 6-8 v at 20 amp, 12-14 v at 20 amp, 24-30 v at 2 amp, 110-115 v at .4 amp, 220-230 v at .2 amp, phenolic case; 1.937" lg x .687" wd x 1-7/8" h o/a; momentary action; solder lug term; two .140" dia mtg holes 1" c to c; JAN spec JAN-S-63.	Exciter interlock.	3Z9558-39.3
S522, S523	SWITCH, sensitive: single ckt; 1/2 hp at 115 or 230 v a-c; phenolic case; 1-3/4" lg x 1/2" wd x 1/2" h; locking action; solder lug term.; two .090" dia mtg holes diagonally spaced on .520" x .312" mtg/c; GE type #CR1070C123-J4.	Limit motor travel B502.	3Z9823-3.14
S701	SWITCH, sensitive: Navy type #-24144; SPST; 1/2 hp at 115 or 230 v a-c, cont rated 10 amp; phenolic body; 1-1/4" lg x 1/2" wd x 9/16" h less term. and button; normally open; 3 solder lug term.; two .096" dia mtg holes on opposite corners of .520" x .312" mtg/c; Collins Rad part/dwg #504 1064 001.	Limit motor travel.	3Z9823-25.3
K506A, S702	SWITCH SECTION, rotary: w/commutating sw attached: steatite stator, coin silver alloy rotor blades; 1 pole, 12 position, shorting type; round; 1-19/32" dia x 3/16" thk wafer; two 3/32" dia mtg holes spaced 1.562" c to c, ctr mtg holes to fit 1/4" dia shaft w/flats; Oak type DHC.	K506A: Commutating switch (part of K506). S702: Limit motor travel.	3Z9903E-3.109

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
S711A, S711B, S711N, S712A, S712N	SWITCH SECTION, rotary: steatite stator, coin silver alloy rotor blades; 1 circuit 1 pole, 12 position, shorting type; oval; 1-7/8" lg x 1-5/8" wd x 3/16" thk; two holes to pass #5 screw spaced 1.562" c to c, ctr mtg hole to fit 1/4" diam shaft w/flats; Oak type HC.	Part of automatic channel selector.	
S711C thru S711H, S711J, S711K, S711M, S712B thru S712H, S712J, S712K, S712M	SWITCH SECTION, rotary: steatite stator, spring silver alloy clips, coin silver alloy rotor blades; 1 pole, 1 circuit, 12 position, oval shape; 1-7/8" lg x 1-5/8" wd x 3/16" thk o/a; two mtg holes for #5 screw spaced on 1.562" mtg/c; ctr hole .253" x .188" for shaft mtg; nonshorting type rotor blades; Oak type HC.	Part of automatic channel selector.	
T801	TRANSFORMER, AF: Navy type #-304899; dual pri 125 ohms impedance ea sect.; secd term. #5 and #8, 100K ohm center tapped #6 and #7, drawn steel, gray finish; 2.500" lg x 1.639" dia o/a; 200 mw max oper level; 8 solder lug term. on bottom on 7/16" rad and 1 gnd term. in ctr; 4 mtg holes tapped 4-40 NC-2, on a 1.312" dia mtg/c; Thordarson catalog #T-51320A.	Input.	2Z9631.506
T502	TRANSFORMER, power: Navy type #-302298; fil type; input 210 v, 220 v, 230 v, 240 v, 250 v, 50/60 cps, single ph; one output wdg; secd 6.30 v at 5.0 amp CT; 2500 v; HS metal case; 4-7/16" lg x 3-1/32" wd x 4-5/16" h o/a; 9 screw type term. on bottom; 4 mtg holes on 2-3/4" x 3-7/8" mtg/c; electrostatic shield connected to case; Chi Trans #6504A.	V501, V502, V503, and V507 filaments.	2Z9604.17
T503	TRANSFORMER, power: Navy type #-304887; fil type; input tapped to oper at 230 v, 220 v, 240 v, 50/60 cps, 72.5 va; 1 output wdg; secd 5.0 v CT, 14.5 amp, 72.5 va; 2500 v test; semisealed metal case; 3.280" lg x 3-21/32" wd x 4.290" h less term. and mtg flange; 7 screw term. on bottom; six .220" dia mtg holes in 2 rows 3.870" apart, 3 on ea side spaced 1-1/8" c to c; Chi Trans type #9762.	V504 filament.	2Z9600.160
T504	TRANSFORMER, power: fil type; input 240 v tapped at 210 v, 220 v, 230 v; 50/60 cps; 2 output wdg; secd #1, 6.3 v at 5.0 amp and secd #2, 150 v tapped at 117 v and 140 v at 4.0 amp; 2500 v RMS test voltage; HS drawn steel case; 5-7/8" lg x 5-5/16" wd x 6-1/8" h o/a excluding term.; 11 stud term. #8-32 NC-2 x 1/2" lg located on bottom of case; fl mtd w/six 17/64" dia mtg holes equally spaced on 1-3/4" x 1-3/4" x 5-3/8" mtg/c; Chi Trans #17807.	Preset tuning control power.	2Z9600.175

4. Identification Table of Parts for Radio Transmitter T-454/FRT-26 (contd)

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
T505, T506	TRANSFORMER, power: Navy type #-304897; our limiting fil type; input 245 v tapped for 208 v, 200 v, 215 v, 230 v, 681 va at 60% pf; 1 output wdg; secd 7.5 v CT, 48 amp; pri 2500 v test, secd 5000 v test; impr coil; semisealed metal case; 10-1/2" lg x 6-3/8" wd x 9" h less term.; 9 screw type term., 6 on 1 side 3 on the other; four 3/8" x 5/8" mtg slots on 9-13/16" x 3-1/4" mtg/c; Thordarson catalog #T-50679.	T505: V505 filament. T506: V506 filament.	2Z9600.161
O 555	TRANSMITTER SUBASSEMBLY: gear train driven exciter tank components; incl 4 gear assem, coil assem, front and back brg, var capacitor, front and back mtg pl and hdw to assemble; 5-9/16" lg x 2" wd x 4-3/16" h o/a; Collins Rad part/dwg #503 9468 004.	Drives for buffer and frequency multiplier tuning.	2C6900-225-1
V1301, V1303	ELECTRON TUBE: JAN type 6X4W.	Rectifiers.	2J6X4W
V501	TUBE, electron: JAN-6AG7Y; video power ampl pent.	Second buffer.	2J6AG7Y
V502 V503	TUBE, electron: JAN-807; transmitting beam power ampl.	V502: First frequency multiplier. V503: Second frequency multiplier.	2J8G7
V504	TUBE, electron: JAN #4-400A; tetrode.	Driver.	2J4-400A
V505, V506	TUBE, electron: JAN #3X2500-A3; triode.	V505: Power amplifier #1. V506: Power amplifier #2.	2J3X2500-A3
V507, V802	TUBE, electron: JAN-12AU7; twin triode.	V507: Keyer. V802: Output stage.	2J12AU7
V508	TUBE, electron: JAN-5696; thyratron.	Preset channel sequence control.	2J5696
V801	TUBE, electron: JAN-12AX7; twin triode.	Input stage.	2J12AX7
O557	TUBING: air; Raybestos curv-flex rubber; 2" ID, 2-1/4" OD max, 23 ft. lg; Collins Rad part/dwg #504 1998 002.	Directs air flow.	6Z8726-9
H502, H1502	WASHER, extruded: SS type #303; round 1/4" ID, 1/2" OD x 1/4" thk; stop washer and retaining ring collar silver soldered; 3/32" x 3/32" projection bent at 90 deg x 1/20"; two #4-48NF-2 tapped holes at 90 deg on collar; Collins Rad part/dwg #505 8055 002.	Limit servo motor travel.	

5. Identification Table of Parts for Power Supply PP-454/FRT-5

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
1001-1099 series	POWER SUPPLY PP-454/FRT-5: electronic; output, d-c, 250 v, 450 ma, 150 v regulated, 250 v nonregulated; a-c, 6.3 v, 14 amp; input, a-c, 105 v - 125 v, 60 cyc, single-phase, 500 w; o/a dimen, 19" lg, 15-1/8" wd, 8-3/4" h.	Power supply.	3H4497-454
1001-1099	POWER SUPPLY PP-454/FRT-5: bare unit for Power Supply PP-454/FRT-5; Same as Power Supply PP-454/FRT-5 except less items on latest issue.	Power supply.	3H4497-454Z
C1003, C1004, C1005, C1006, C1007	CAPACITOR, fixed: paper dielectric; 4 uf +20-10%; 600 vdcw; JAN type CP40C2FF405V.	C1003, C1004: Filters in KY-45/B+ supply. C1005, C1006, C1007: Filters in KY-45/negative supply.	3DB4-303
C1001, C1002	CAPACITOR, fixed: paper dielectric; JAN type #CP70B1DF106V; 10 uf +20%-10%; 600 vdcw; 3-3/4" wd x 1-1/4" d x 4-3/4" h.	Filter in M-O B+ supply.	3DB10-233
E1002, E1003, E1004	CLIP: electrical, resistor; 3.067" lg x 1/4" h x 5/8" wd o/a; Collins Rad part/dwg #504 1475 001.	E1002: Clip for R1006. E1003: Clip for R1007. E1004: Clip for R1008.	2Z2712.204
E1005, E1006	CLIP: electrical; resistor; nickel pl beryllium copper; 2-1/16" lg x 1/4" wd x 5/8" h o/a; Collins Rad part/dwg #503 9607 002.	Clips for R1002.	2Z2712.205
P1002, P1003	CONNECTOR, plug: 10 flat male cont, pol; straight; 1-9/16" lg x 11/16" wd x 1-5/8" h, less cont, incl clamp; Jones HB #P-310-CCT.	P1002: Output cable power supply to M-O. P1003: Output cable power supply to frequency shift keyer.	2Z71303
P1004	CONNECTOR, plug: three curved twist-lock female cont pol; 1-1/2" dia x 2-5/32" lg incl cable clamp; Hubbell #7559.	A-c power cable to power supply.	6Z7591-3.1
J1001, J1002	CONNECTOR, receptacle: 10 rectangular female pol cont; 1-9/16" lg x 11/16" wd x 1/2" d, less cont and mtg bkt; Jones HB catalog #S-310-AB1/16.	J1001: Connects to M-O unit O-91/FRT-5. J1002: Connects to frequency shift keyer unit KY-45/FRT-5.	Z8639-6
P1001	CONNECTOR, receptacle: Navy type #-49749-A; 3 curved rectangular male pol cont; 2-5/16" lg x 1-3/4" wd x 1-1/4" d o/a; cont rated 10 amp 250 v, 15 amp, 125 v; Hubbell type #7556.	A-c connector.	6Z7813-2
F1001	FUSE, cartridge: Navy type #-28032-3; 3 amp, blowing time, life at 110%, 1 hr at 135%, 5-60 sec at 200% load; 250 v; one time; ferrule term.; 1/4" dia x 1-1/4" lg o/a; Littlefuse #1043.	For 110-volt line.	3Z2603.2

5. Identification Table of Parts for Power Supply PP-454/FRT-5 (contd)

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
F1002	FUSE, cartridge: Navy type #-28032-2; 2 amp, blowing time, life at 110%, 1 hr at 135%, 5-60 sec at 200% load; 250 v; 1/4" dia x 1-1/4" lg o/a; Littelfuse type 3AG, catalog #1042.	For 110-volt line.	3Z2602.26
F1003	FUSE, cartridge: Navy type #-28032-1R5; 1-1/2 amp, blowing time, life at 110%, 1 hr at 135%, 5 to 60 sec at 200% load; 250 v; 1/4" dia x 1-1/4" lg o/a; Littelfuse #1041.	For 230-volt line.	3Z2601.5
F1004	FUSE, cartridge: Navy type #-28032-1; 1 amp, blowing time, life at 110%, 1 hr at 135%, 2 min at 200% load; 250 v; 1/4" dia x 1-1/4" lg o/a; Littelfuse #1040.	For 230-volt line.	3Z1926
XF1001, XF1002, XF1003, XF1004	FUSEHOLDER: Buss type HKP.	XF1001: Holder for fuse F1001. XF1002: Holder for fuse F1002. XF1003: Holder for fuse F1003. XF1004: Holder for fuse F1004.	3Z3282-42.9
I1001	LAMP, glow: 110 v to 120 v a-c or d-c, 1/10 w; rectangular translucent white 1-7/8" lg; Littelfuse #201001, Collins part/dwg 262 0074 00.	Pilot lamp.	2Z5889-27
L1001 thru L1003	REACTOR: Navy type #-304883; filter choke; 7.5 hy, 280 ma, 100/120 cps; 75 ohm d-c resistance; 1500 v insulation; 4-1/4" lg x 3-11/16" wd x 5-9/16" h case; Collins Rad part/dwg #678 0291 00.	L1001: Filter choke M-O supply. L1002, L1003: Filter chokes for KY-45/B+ supply.	3C325-22
R1006 thru R1008	RESISTOR, fixed: WW; 10,000 ohms ±5%; 18 w at 275° C max continuous oper temp; 3" lg x 19/32" dia; 2 tab term. 11/32" lg x 21/64" wd x 1/64" thk; WL type #M-33; Collins Rad part/dwg #747 9086 00.	R1006: Filter resistor in -100 v supply. R1007: Filter in -100 v supply. R1008: Bleeder in -100 v supply.	3Z6610-334
R1001	RESISTOR, fixed: comp; JAN type RC30BF473K; 47,000 ohms ±10%; 1 w.	V dropping for I 1001.	3RC30BF473K
R1003 R1005	RESISTOR, fixed: comp; JAN type RC42BF104K; .10 megohm ±10%; 2 w.	R1003: Bleeder in M-O B+ supply. R1005: Bleeder in KY-45/B+ supply.	3RC42BF104K
R1002, R1004	RESISTOR, fixed: WW; JAN type RW32F312; 3100 ohms ±5%; 12 w at max continuous oper temp 275° C.	R1002: V dropping in M-O + 150 V regulated supply. R1004: V dropping in KY-45/B+ supply.	3RW27323

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E1007 thru E1009	SHIELD, tube: 2.312" ID x 11/16" d; Johnson EF catalog #16-100.	E1007, E1008: Holddown shields for V-1003. E1008, E1009: Holddown shield for V-1009.	2Z8304.256
XV1001, XV1002, XV1004	SOCKET, tube: octal; 1 piece saddle mtg; Amphenol #88-8 TM; ea.	XV1001: Mounts V1001. XV1002: Mounts V1002. XV1004: Mounts V1004.	2Z8654
XV1003, XV1005, XV1006	SOCKET, tube: 7 cont miniature; JAN type TS102P01.	XV1003: Mounts V1003. XV1005: Mounts V1005. XV1006: Mounts V1006.	2Z8677.94
S1003AB	SWITCH, rotary: 5 position; 2 ckt; 1-7/8" lg x 1-21/32" wd x 1" d body; nonshorting; Collins Rad part/dwg #259 0361 00.	Voltmeter switch.	3Z9825-50.12
S1001, S1002A, S1002B	SWITCH, toggle: DPDT; JAN-ST52N; 30 amp continuous cur. carrying capacity; 1-21/64" lg x 49/64" wd x 3/4" d body.	S1001: ON-OFF. S1002A, S1002B: 115 V to 230 V.	3Z9863-52N
T1001	TRANSFORMER, power: Navy type #304884; fil and plate; input 2 pri wnd both rated 125 v tapped to operate at 105 v, 115 v, 50/60 cps, single ph; secd #1, 720 v ct, sect #2, 6.3 v 8.5 amp, secd #3, 5 v 4 amp; 1500 v insulation; 5-5/8" lg x 4-3/16" wd x 5-17/32" h case; Collins Rad part/dwg #672 0290 00.	M-O power supply.	2Z9612.333
T1002	TRANSFORMER, power: Navy type #-304885; fil and plate; input 2 pri wnd, ea rated 125 v tapped to operate at 105 v and 115 v, 50/60 cyc, single ph; 4 output wnd; secd #1, 740 v ct, secd #2, 6.3 v 6 amp, secd #3, 6.3 v, .6 amp, secd #4, 5 v 2 amp; 1500 v insulation; 5-5/8" lg x 4-3/16" wd x 5-17/32" h case; Collins Rad part/dwg #672 0289 00.	KY-45/power supply.	2Z9618-135
V1001, V1002, V1004	TUBE, electron: JAN-5R4WGY.	Rectifiers.	2J5R4WGY
V1003	TUBE, electron: JAN-6X4W.	Rectifiers.	2J6X4W
V1005, V1006	TUBE, electron: JAN OA2.	V regulators.	2JOA2
M1001	VOLTMETER: d-c; range 0 to 500 v; 2.75" dia body, sub-base 2-1/2" dia, 1.665" d, behind fl, 3" x 3.120" x .200" fl; 2% accuracy for full scale reading; sensitivity 1,000 ohm per v; calibrated for nonmagnetic panel; scale marked 0 to 500 v; Weston Model 301.	Multimeter to monitor various supply voltages.	3F8500-9

6. Identification Table of Parts for R-F Oscillator O-91/FRT-5

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
101-299	RF OSCILLATOR O-91/FRT-5: frequency range 2 to 4.5 mc, 1 band, 10 individual channels, any frequency between 2 and 4.5 mc; power output 2 w; a-c filament power, 115 v, 50-60 cps, single ph approx 75 w; d-c plate supply 250 v; filament power supply internal, plate supply external; 19" lg x 15-1/8" wd x 10-1/2" h o/a; mts in standard 19" relay rack.		2C2709-91
O129	ARM: actuator; 2-1/8" lg x 13/32" h x .360" wd o/a; Collins Rad part/dwg #504 0769 001.	Actuates disc.	2Z379-4
O131	ARM: actuator; c/o side mtg bkt hinged roller leaf, two #2-56 x 3/4" lg screws and two nuts per screw; 1-31/32" lg x 1-15/32" h x 5/16" thk o/a; four mtg holes 3/32" dia .625" x 1.00" mtg/c; Collins Rad part/dwg #260 0838 00.	Actuates S104.	2Z379-5
C210	CAPACITOR, fixed: ceramic dielectric; 3 uuf ±1/2 uuf; 500 vdcw; .400" lg x .200" dia; Collins Rad part/dwg 916 0145 00.	Coupling V110 to V129.	
C117	CAPACITOR, fixed: ceramic dielectric; 5 uuf ±1/2 uuf; 500 vdcw; .400" lg x .200" dia; Collins Rad part/dwg 916 0118 00.	Coupling V104 to V105.	
C233 thru C236, C239	CAPACITOR, fixed: ceramic dielectric; 10 uuf ±1/2 uuf; 500 vdcw; .400" lg x .200" dia; Collins Rad 916 0138 00.	C233: V112 grid drive limiter. C234: Harmonic amplifier plate tank (part of T101). C235: Harmonic amplifier plate tank (part of T102). C236: Multiplier plate tank (part of T105). C239: Harmonic amplifier plate tank.	
C194, C195	CAPACITOR, fixed: ceramic dielectric; 12 uuf ±5%; 500 vdcw; .400" lg x .240" dia; Collins Rad part/dwg 916 0141 00.	C194: Coupling V127 to V128. C195: Feedback from V128 and V127.	
C106, C111, C122, C154, C167, C172, C238	CAPACITOR, fixed: ceramic dielectric; 20 uuf ±5%; 500 vdcw; .460" lg x .240" dia; Collins Rad part/dwg 916 4188 00.	C106: Coupling output of V101 to grid of V129. C111: Coupling V102 to V103. C122: Coupling V102 to V106. C154: Coupling V112 to V114. C167: Coupling V115 to V116.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		C172: Coupling V116 to V117. C238: Low pass filter.	
C159	CAPACITOR, fixed: ceramic dielectric; 30 uuf ±5%; 500 vdcw; .460" lg x .240" dia; Collins Rad part/dwg 916 4337 00.	Coupling V112 to V113.	
C173, C174	CAPACITOR, fixed: ceramic dielectric; 39 uuf ±5%; 500 vdcw; .460" lg x .240" dia; Collins Rad part/dwg 916 4352 00.	Part of time constant circuit V117.	
C129, C130, C168, C169, C187 C197, C211	CAPACITOR, fixed: 47 uuf ±5%; 500 vdcw; .460" lg x .240" dia max; Collins Rad part/dwg 916 4362 00.	C129, C130: Coupling V105 to V108. C168, C169: Part of time constant circuit V116. C187: Connects plates of V125 and V126. C197: Tuning plate tank V128 (part of T111). C211: Tuning plate tank V127 (part of T111).	
C102B	CAPACITOR, fixed: JAN type #CC35CH470K; 47 uuf ±10%; 500 vdcw; 1.165" lg x .315" dia.	Padding C103 in 100-kc crystal standard.	3D9047-54
C176	CAPACITOR, fixed: ceramic dielectric; 56 uuf ±10%; 500 vdcw; .460" lg x .240" dia; Collins Rad part/dwg 916 4966 00.	V117 input bypass.	
C164, C165	CAPACITOR, fixed: 68 uuf ±5%; 500 vdcw; .460" lg x .240" dia; Collins Rad part/dwg 916 4972 00.	Part of time constant circuit V115.	
C105	CAPACITOR, fixed: ceramic dielectric; 75 uuf ±5%; 500 vdcw; .460" lg x .240" dia; Collins Rad part/dwg 916 4976 00.	Bypasses harmonics of 100-kc at grid of V129.	
C110, C115, C124, C177, C196	CAPACITOR, fixed: JAN type #CC30UJ101J; 100 uuf ±5%; 500 vdcw; .460" lg x .240" dia.	C110: Coupling V107 to V102. C115: Coupling V103 to V104. C124: Tuning T103 primary in plate of V106 (part of T103). C177: Coupling V117 to V118. C196: Tuning plate tank V128 (part of T111).	3D9100-230
C102A, C132 thru C135, C137 thru C140,	CAPACITOR, fixed: ceramic dielectric; 75 uuf ±2%; 500 vdcw; .860" lg x .250" dia; Collins Rad part/dwg 916 7284 00.	C102A: Padding C103 in 100-kc crystal standard. C132, C133: Tuning T106 primary (part of T106). C134, C135: Tuning T106 secondary (part of T106).	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C142 thru C145, C147 thru C150, C232, C1112		C137, C138: Tuning T107 primary (part of T107). C139, C140: Tuning T107 secondary (part of T107). C142, C143: Tuning T108 primary (part of T108). C144, C145: Tuning T108 secondary (part of T108). C147, C148: Tuning T109 primary (part of T109). C149, C150: Tuning T109 secondary (part of T109). C232: Padding C103 in 100-kc standard osc. C1112: V1101 feedback.	
C188 thru C191	CAPACITOR, fixed: mica; JAN type #CM20B470M; 47 uuf ±20%; 500 vdcw; 51/64" lg x 15/32" wd x 7/32" d.	C188, C189: Coupling V125 to T111. C190, C191: Coupling V126 to T111.	3K2047024
C107, C108	CAPACITOR, fixed: JAN #CM20B221M; 220 uuf ±20%; 500 vdcw; 51/64" lg x 15/32" wd x 7/32" d.	Part of time constant circuit V102.	3K2022124
C231	CAPACITOR, fixed: mica; JAN #CM20B331K; 330 uuf ±10%; 500 vdcw; 51/64" lg x 15/32" wd x 7/32" d.	Part of wave trap plate V101.	3K2033121
C186, C199	CAPACITOR, fixed: mica; JAN #CM20B331M; 330 uuf ±20%; 500 vdcw; 51/64" lg x 15/32" wd x 7/32" d.	C186: Tuning T112 (part of T112). C199: Coupling V129 to V126.	3K2033124
C160, C161, C162	CAPACITOR, fixed: mica; 470 uuf ±5%; 300 vdcw; 1/2" lg x 9/32" wd x 11/64" h o/a; Collins Rad part/dwg #912 0542 00.	Tuning T110 (part of T110).	3D9070-56
C104, C112, C113, C152, C185, C192	CAPACITOR, fixed: mica; JAN type #CM20B471M; 470 uuf ±20%; 500 vdcw; 51/64" lg x 15/32" wd x 7/32" thk.	C104: Coupling 100-kc crystal oscillator to grid No. 3 of V101. C112, C113: Part of time constant circuit V103. C152: Bypass suppressor grid V112. C185: Tuning T112 (part of T112). C192: Tunes plate tank V127 (part of T111).	3K2047124

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C101, C163, C179 thru C182	CAPACITOR, fixed: mica; JAN type #CM30B102M; 1000 uuf ±20%; 500 vdcw; 53/64" lg x 53/64" wd x 7/32" thk.	C101: Couples J106 to external-internal switch. C163: Coupling T110 to V115. C179, C180: Part of low-pass filter in grids of V123. C181, C182: Part of low-pass filter in grids of V124.	3K3010224
C156, C230, C237	CAPACITOR, fixed: mica; JAN type #CM30B222M; 2200 uuf ±20%; 500 vdcw; 53/64" lg x 53/64" wd x 9/32" d.	C156: D-c blocking in plate tank V113. C230: V1101 plate bypass. C237: Multiplier plate tank (part of T604).	3K3022221
C127	CAPACITOR, fixed: JAN type #CM30B332M; 3300 uuf ±20%; 500 vdcw; 53/64" lg x 9/32" h x 53/64" wd case.	Coupling V107 to J105.	3K3033224
C109, C114, C119, C121, C151, C166, C170, C171, C175, C183, C184, C200, C229	CAPACITOR, fixed: JAN type #CM35B103M; 10,000 uuf ±20%; 300 vdcw; 53/64" lg x 53/64" wd x 11/32" thk.	C109: V102 cathode bypass. C114: V103 cathode bypass. C119: D-c blocking in plate tank V104. C121: D-c blocking in plate tank V105. C151: Bypass bias resistor R153 grid V127. C166: V115 cathode bypass. C170: V116 cathode bypass. C171: Plate bypass V116, V117, V118. C175: V117 cathode bypass. C183: Part of low-pass filter in grid of V123. C184: Part of low-pass filter in grid of V124. C200: Across contacts of J103. C229: D-c blocking plate of V101.	3K3510324
C202, C203	CAPACITOR, fixed: mica; JAN type #CM45B103M; 10,000 uuf ±20%; 600 vdcw; 1-5/8" lg x 1-1/8" wd x 23/64" h.	Tuning AFC motor field.	3K4510324
C204A, C204B	CAPACITOR, fixed: paper dielectric; 2 sect.; 100,000 uuf per sect. ±15%; 600 vdcw; HS metal can; 1-13/16" lg x 1" wd x 3/4" h; Collins Rad part/dwg #504 5647 001.	Phase splitting in AFC motor field located between K101 and S104.	3DA100-1193

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C205	CAPACITOR, fixed: paper dielectric; JAN #CP-29A1DF104M; 100,000 uuf ±20%; 600 vdcw; HS metal case; 5/8" dia x 1-7/8" lg.	Suppressor across thermostat contacts in crystal oven.	3DA100-856
C116A, C116B, C116C, C118A, C118B, C118C, C123A, C123B, C123C, C131A, C131B, C131C, C136A, C136B, C136C, C141A, C141B, C141C, C146A, C146B, C146C, C198A, C198B, C198C, C201A, C201B, C201C	CAPACITOR, fixed: paper dielectric; 3 sect.; 1 uf per sect., +40 -15%; 600 vdcw; HS metal case; 1-13/16" wd x 1" d x 3/4" h; 3 solder lug term. located on side, spaced 1/2" c to c; Collins Rad part/dwg #504 0644 002.	C116A: V104 cathode bypass. C116B: V104 screen grid bypass. C116C: Decoupling in plate supply V102 and V103. C118A: V105 cathode bypass. C118B, C123A: V105 screen grid bypass. C118C: Decoupling on plus 250 volt line. C123B: V106 cathode bypass. C123C: D-c blocking plate tank V106. C131A: V108 cathode bypass. C131B: V108 screen grid bypass. C131C: D-c blocking in plate tank V108. C136A: V109 cathode bypass. C136B: V109 screen grid bypass. C136C: D-c blocking plate tank V109. C141A: V110 cathode bypass. C141B: V110 screen grid bypass. C141C: D-c blocking plate tank V110. C146A: V111 cathode bypass. C146B: V111 screen grid bypass. C146C: D-c blocking plate tank V111. C198A: V128 cathode bypass. C198B: V128 screen bypass. C198C: D-c blocking in plate tank V128. C201A: V129 cathode bypass. C201B: V129 screen bypass.	3DA100-1194

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		C201C: Decoupling on 250-volt line.	
C125A, C125B, C125C, C153A, C153B, C153C, C155A, C155B, C155C, C157A, C157B, C157C,	CAPACITOR, fixed: paper dielectric; JAN type #CP54B5FF104X; 3 sect.; 100,000 uuf per sect. +40% -15%; 600 vdcw; HS metal case; 1-13/16" wd x 1" d x 3/4" h.	C125A: Decoupling in screen lead #3 on J113. C125B: Decoupling in +250 volt line. C125C: Decoupling in +150 volt line. C153A: D-c blocking in plate tank V112. C153B: V112 cathode bypass. C153C: V112 screen grid bypass. C155A: V113 cathode bypass. C155B: V113 screen grid bypass. C155C: Decoupling on 250 volt line. C157A: V114 screen grid bypass. C157B: D-c blocking plate tank V114. C157C: V114 cathode bypass.	3DA100-1195
C193A BC	CAPACITOR, fixed: paper dielectric; 3 sect.; 100,000 uuf per sect. +40 -15%; 600 vdcw; HS metal can; 1" d x 1-13/16" wd x 3/4" h; Collins Rad part/dwg #504 0645 002.	V127 screen grid bypass, V127 cathode bypass, d-c blocking plate tank V127 (for maintenance use JAN capacitor CP-54B5FF104V and two rivnuts Symbol E120).	3DA100-1196
C120A BCD	CAPACITOR, variable: Navy type #-484974; air dielectric; 241.2 uuf effective max capacity, per sect.; 13 uuf max min; 5" lg x 3-3/16" wd x 1-7/8" h excluding shaft, shaft 1/4" dia x 2-5/32" lg; Collins Rad part/dwg #504 0665 003.	Tunes plate tank of V105, tunes plate tank of V104, tunes plate tank of V113, tunes plate tank of V112.	3D9241VE2.1
C128A, C128B, C128C, C128D	CAPACITOR, variable: ceramic; JAN type #CV-11B130; rotary type, single sect.; 3 to 13 uuf; 500 vdcw; 23/32" lg x 41/64" wd x 27/32" h o/a.	C128A: Padder, plate tank V105. C128B: Padder, plate tank V104. C128C: Padder, plate tank V113. C128D: Padder, plate tank V112.	3D9013V-10
C103	CAPACITOR, variable: ceramic; JAN type #CV12C121; rotary type, single sect.; 20 to 125 uuf; 500 vdcw; 1.019" lg x 15/16" wd x 1.218" h.	Crystal calibration in 100-kc crystal standard.	3D9125V-1.1
L107	COIL, RF: choke; 1 wnd, 4 pie, duolateral wnd; unshielded; 2.5 mh ±10%, 250 ma d-c, 52-1/2 ohm d-c resistance; 2-7/32" lg x 7/16" diam; Millen type #34102.	Rf choke plate of V101.	3C341-3

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
J113, J114	CONNECTOR, plug: four female lug type cont, pol, banana sockets; 1-5/8" lg x 3/8" wd x 3/8" thk o/a; Collins Rad part/dwg #502 6686 002.	J113: MO jack. J114: Interpolation oscillator jacks.	2Z3065-133
P104	CONNECTOR, plug: Navy type #-49277; 10 flat parallel female cont pol; 1-9/16" lg x 11/16" wd x 1-5/8" h incl clamp; Jones HB #S-310-CCT.	Output cable assembly from MO to power supply.	2Z8680-5
P105	CONNECTOR, plug: Navy type #-49903; 2 rectangular female pol cont; straight; 1.156" lg x .1968" dia o/a; 10 amp 250 v, 15 amp 125 v; GE cat. #2981.	A-c power line to crystal oscillator.	2Z3063-120
J101	CONNECTOR, receptacle: Navy type #-491144; 10 rectangular male pol cont; straight; 1-9/16" lg x 1-3/8" wd x 1/2" d; Jones HB cat. #P-310-AB.	Power supply input.	2Z7120.12
J102	CONNECTOR, receptacle: Navy type #-49844; 2 rectangular male nonpol cont; straight; 1-29/32" lg x 1-1/4" wd x 61/64" h o/a; GE cat. #2711.	115-volt a-c input.	6ZK-7799-13
J104, J105, J106; J108	CONNECTOR, receptacle: Navy type UG-290/U; single round female pol cont; straight; 1-1/16" lg x 11/16" wd x 11/16" d o/a; Industrial Products Co cat. #2700.	J104: 450-kc output. J105: 100-kc output. J106: 100-kc input from external source. J108: 2- to 4.5-mc output.	2Z7390-290
O 124	COUPLING, shaft, flexible: incl coupler, sleeve, #8-36 x 1/8 set screw, and pin; 1-1/4" dia x 1-1/16" lg o/a; Collins Rad part/dwg #504 5045 001.	Coupler assembly for output tuning control.	2Z3295-204
Y101	CRYSTAL UNIT, quartz: Navy type #-40346; single xtal pl; temp range minus 20° C to plus 60° C oven temp 60° C at 110 v a-c; p/o Collins Rad master oscillator equip part/dwg 520 4391 00; J Knights type JKO-7.	100-kc crystal for crystal standard.	2X223.2-100
F101	FUSE, cartridge: Navy type #-28053-1/2; 1/2 amp, blowing time, life at 110%, 1 hr at 133%, 5-60 sec at 200% load; 250 v; 1-1/4" lg x 1/4" dia o/a; Littelfuse #313.500.	Fuse all power except crystal oven.	3Z2595.7
F102	FUSE, cartridge: Navy type #-28053-1/8; 1/8 amp, blowing time, life at 110%, 1 hr at 133%, 5-60 sec at 200% load; 250 v; 1-1/4" lg x 1/4" dia; Littelfuse #1263.	Fuse, crystal oven.	3Z2585.5
O 108, O 118, O 125	GEAR: spur; 45 teeth; 1" OD x 13/32" thk o/a; Collins Rad part/dwg #504 0772 001.	O 108: Idler for interpolation oscillator drive gear. O 118: Drive idler gear for M-O. O 125: Idler for output tuning.	2Z4878A-331

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
O 102	GEAR ASSEMBLY: incl 5 gears staked to hub; 3-1/4" dia x 17/32" thk o/a; 3/16" dia shaft hole in ctr; Collins Rad part/dwg #504 0628 002.	Idler for interpolation oscillator tuning drive.	2Z4875-517
O 112	GEAR ASSEMBLY: drive; five gears and groove pin; 2-3/16" dia x 17/32" thk o/a; 3/16" shaft hole; Collins Rad part/dwg #504 0627 002.	Idler gear for M-O tuning drive.	2Z4875-516
XF101, XF102	HOLDER, fuse: extractor post type; for single 3AG cartridge fuse; 5 amp, 125 v; 2-5/16" lg x 13/16" dia o/a; 1/2-24 NS-2 threaded body for panel hole mtg; Collins Rad part/dwg #265 1002 00.	XF101: Holder for F101. XF102: Holder for F102.	3Z3282-42.9
J103	JACK, telephone: Navy type #491973; for 2 cond plug .250" dia; 1-11/16" lg x 1-11/16" wd x 3/4" h o/a; 3/8" -32 NEF-2 thd for mtg 7/16" mtg hole; Mallory catalog #705.	Headphone.	2Z5581-16
E 101	KNOB: for 1/4" dia shaft; two holes tapped #6-40 NF-2 at 90°; 15/16" dia x 9/16" thk; .406" d shaft hole; Collins Rad part/dwg #502 6085 002.	R-f oscillator tuning knob.	2Z5824.123
E102	KNOB: round; blk enamel aluminum; for .188" dia shaft; #6-32 thd hole through side; .437" dia x .343" thk; .219" d shaft hole; Collins Rad part/dwg #503 8779 003.	R-f oscillator locking knobs.	2Z5822-291
I 101, I 102, I 104	LAMP, glow: 110 to 120 v a-c or d-c, 1/10 w; mtg base 1-7/8" lg x 9/16" wd x 7/32" thk; Littelfuse type #201 001.	I 101: Pilot, indicates that crystal oven heaters are on. I 102: Pilot, indicates 250 volts on. I 104: Pilot, indicates afc on.	2Z5889-27
B101	MOTOR, AC: Navy type #-212034; .1361 hp, 1150 rpm; pulley not incl, plain shaft; 2-3/8" lg x 2-9/16" wd x 2-9/16" h o/a; shaft 1/8" dia, protrudes 19/32" from side of frame; 220 v a-c, 60 cyc, 2 phase, .10 amp per phase; Collins Rad part/dwg #504 0797 004.	C126 centering (afc).	3H3000A12-18
Z101	OSCILLATOR, RF: freq range 600 to 800 kc; not crystal controlled; .001 w output; 5" lg x 2-13/16" wd x 5" h o/a; integral coils; receives power from main rect unit of xmtr; mts in sealed metal case; Collins Rad part/dwg #503 9550 003.	Interpolation oscillator.	2C2718-6
Z102	OSCILLATOR, RF: freq range 1 to 1.5 mc; not crystal controlled; .001 w output; 5" lg x 2-13/16" wd x 5" h o/a; integral coils; receives power from main rect unit of xmtr; mts in sealed metal case; Collins Rad part/dwg #503 9558 003.	Master oscillator.	2C2718-7
K101	RELAY, armature: Navy type #-291774; cont rating 2 amp, 110 v a-c noninductive load; silver cont; solder lug term. on coil and cont; 1-5/8"	Capacitor centering for afc.	2Z7599A-21

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	lg x 1-11/16" wd x 1-1/4" h max o/a; fast acting; Collins Rad part/dwg #972 1116 00.		
R158	RESISTOR, fixed: JAN type #RC42BF200J; 20 ohms ±5%; 2 w; 2 axial wire lead term.	Decoupling in plates of V102 and V103.	3RC42BF200J
R146	RESISTOR, fixed: JAN type #RC20BF470K; 47 ohms ±10%; 1/2 w; 2 axial wire lead term.	Parasitic suppressor grid of V110.	3RC20BF470K
R124, R197	RESISTOR, fixed: JAN type #RC20BF101K; 100 ohms ±10%; 1/2 w; 2 axial wire lead term.	R124: V104 cathode. R197: V118 cathode.	3RC20BF101K
R104	RESISTOR, fixed: comp; JAN type #RC20BF151K; 150 ohms ±10%; 1/2 w; 2 axial wire lead term.	V101 grid.	3RC20BF151K
R132, R140, R147, R156, R222	RESISTOR, fixed: comp; JAN type #RC20BF221K; 220 ohms ±10%; 1/2 w; 2 axial wire lead term.	R132: V106 cathode. R140: V108 cathode. R147: V110 cathode. R156: V112 cathode. R222: V127 cathode.	3RC20BF221K
R143, R150	RESISTOR, fixed: comp; JAN type #RC20BF331K; 330 ohms ±10%; 1/2 w; 2 axial wire lead term.	R143: V109 cathode. R150: V111 cathode.	3RC20BF331K
R127, R160, R231	RESISTOR, fixed: comp; JAN type #RC20BF561K; 560 ohms ±10%; 1/2 w; 2 axial wire lead term.	R127: V105 cathode. R160: V113 cathode. R231: V129 cathode.	3RC20BF561K
R164	RESISTOR, fixed: comp; JAN type #RC30BF561K; 560 ohms ±10%; 1 w; 2 axial wire lead term.	V114 cathode.	3RC30BF561K
R187	RESISTOR, fixed: comp; JAN type #RC30BF681K; 680 ohms ±10%; 1 w; 2 axial wire lead term.	Plate decoupling V116, V117, and V118.	3RC30BF681K
R227	RESISTOR, fixed: comp; JAN type #RC20BF102K; 1000 ohms ±10%; 1/2 w; 2 axial wire lead term.	V128 cathode.	3RC20BF102K
R167, R168, R618	RESISTOR, fixed: comp; JAN type #RC30BF102K; 1000 ohms ±10%; 1 w; 2 axial wire lead term.	R167: V112 plate decoupling. R168: V131 screen decoupling. R618: Monitor divider.	3RC30BF102K
R198	RESISTOR, fixed: comp; JAN type #RC42BE102K; 1000 ohms ±10%; 2 w; 2 axial wire lead term.	Decoupling for V118 and V130.	
R207, R208	RESISTOR, fixed: comp; JAN type #RC20BF122K; 1200 ohms ±10%; 1/2 w; 2 axial wire lead term.	R207: V123 cathode. R208: V124 cathode.	3RC20BF122K
R166	RESISTOR, fixed: comp; JAN type #RC42BF152K; 1500 ohms ±10%; 2 w; 2 axial wire lead term.	V114 screen.	3RC42BF152K
R102, R129, R135, R137,	RESISTOR, fixed: comp; JAN type #RC20BF222K; 2200 ohms ±10%; 1/2 w; 2 axial wire lead term.	R102: V101 cathode. R129: V105 plate dropping. R135: V107 cathode.	3RC20BF222K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R142, R149, R224, R226		R137: V104 plate voltage dropping. R142: V108 plate decoupling. R149: V110 plate decoupling. R224: Decoupling V128 plate. R226: V127 plate decoupling.	
R242	RESISTOR, fixed: comp; JAN type #RC20BF222K; 2200 ohms ±20%; 1/2 w; 2 axial wire lead term.	Drive limiting grid V112.	3RC20BF222K
R169, R192, R229	RESISTOR, fixed: comp; JAN type #RC20BF472K; 4700 ohms ±10%; 1/2 w; 2 axial wire lead term.	R169: Part of 100-kc filter T110. R192: V117 cathode. R229: V127 grid.	3RC20BF472K
R110, R113, R118, R121, R174, R177, R182, R185, R191, R194	RESISTOR, fixed: comp; JAN type #RC20BF103K; 10,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R110, R113: V102 grids. R118, R121: V103 grids. R174, R177: V115 grids. R182, R185: V116 grids. R191, R194: V117 grids.	3RC20BF103K
R154	RESISTOR, fixed: comp; JAN type #RC20BF153J; 15,000 ohms ±5%; 1/2 w; 2 axial wire lead term.	Parasitic suppressor V111 grid.	3RC20BF153J
R243	RESISTOR, fixed: comp; JAN type #RC20BF153K; 15,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	Drive limiting grid V109.	3RC20BF153K
R145, R152, R188	RESISTOR, fixed: comp; JAN type #RC20BF223K; 22,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R145: V109 plate dropping. R152: V111 plate voltage dropping. R188: V117 plate load.	3RC20BF223K
R162	RESISTOR, fixed: comp; JAN type #RC30BF223K; 22,000 ohms ±10%; 1 w; 2 axial wire lead term.	V113 plate voltage dropping.	3RC30BF223K
R221	RESISTOR, fixed: comp; JAN type #RC42BF223K; 22,000 ohms ±10%; 2 w; 2 axial wire lead term.	V127 screen.	3RC42BF223K
R133	RESISTOR, fixed: comp; JAN type #RC30BF273J; 27,000 ohms ±5%; 1 w; 2 axial wire lead term.	V106 voltage dropping.	3RC30BF273J
R107, R108, R115, R116, R136, R171, R172,	RESISTOR, fixed: comp; JAN type #RC20BF273K; 27,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R107, R108: V102 plate load. R115, R116: V103 plate load. R136: V107 screen and plate load. R171, R172: V115 plate load.	3RC20BF273K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R179, R180, R189, R223, R233		R179, R180: V116 plate load. R189: V117 plate load. R223: V127 grid. R233: V129 plate dropping.	
R111, R112, R119, R120, R175, R176, R183, R184, R193, R244	RESISTOR, fixed: comp; JAN type #RC20BF333K; 33,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R111: V102 cathode. R112: V102 grid. R119: V103 cathode. R120: V103 grid. R175: V115 cathode. R176: V115 grid. R183: V116 cathode. R184: V116 grid. R193: V117 grid. R244: V117 cathode.	3RC20BF333K
R125, R157, R243	RESISTOR, fixed: comp; JAN type #RC20BF393K; 39,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R125: V104 screen dropping. R157: V112 screen. R243: Drive limiting grid V109.	3RC20BF393K
R103, R106, R109, R114, R117, R122, R128, R170, R173, R178, R181, R186, R190, R195	RESISTOR, fixed: comp; JAN type #RC20BF473K; 47,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R103, R106: V101 plate voltage dropping. R109, R114: Parts of V102 time constant circuit. R117, R122: Parts of V103 time constant circuit. R128: V105 screen dropping. R170: Parts of 100-kc filter T110 (p/o T110). R173, R178: Parts of time constant circuit V115. R181, R186: Parts of time constant circuit V116. R190, R195: Parts of time constant circuit V117.	3RC20BF473K
R126, R144, R151, R153, R228, R232, R245	RESISTOR, fixed: comp; JAN type #RC20BF683K; 68,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R126: V105 grid. R144: V109 screen dropping. R151: V111 screen. R153: V127 grid. R228: V128 screen. R232: V129 screen dropping.	3RC20BF683K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		R245: V112 suppressor grid.	
R196	RESISTOR, fixed: JAN type #RC30BF683K; 68,000 ohms ±10%; 1 w; 2 axial wire lead term.	V118 plate voltage dropping.	3RC30BF683K
R130, R243	RESISTOR, fixed: comp; JAN type #RC20BF823K; 82,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R130: V106 screen dropping. R243: Drive limiting grid V109.	3RC20BF823K
R101, R105, R134, R138, R139, R163, R213, R214, R215, R216, R217, R218, R219, R220, R230, R234	RESISTOR, fixed: comp; JAN type #RC20BF104K; 100,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R101, R105: V101 grid. R134: V107 grid. R138, R139: V108 grid. R163: V114 grid. R213, R214: Parts of low-pass filter V123 input. R215, R216: Parts of low-pass filter V124 input. R217, R218: Parts of low-pass filter V123 input. R219, R220: Parts of low-pass filter V124 input. R230: V129 grid. R234: Voltage dropping for I 102.	3RC20BF104K
R141, R148, R205, R206	RESISTOR, fixed: comp; JAN type #RC20BF154K; 150,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R141: V108 screen dropping. R148: V110 screen. R205: Voltage dropping V123. R206: Voltage dropping V124.	3RC20BF154K
R155	RESISTOR, fixed: comp; JAN type #RC20BF224K; .22 meg ±20%, 1/2 w; 2 axial wire lead term.	V113 suppressor grid dropping.	3RC20BF224K
R161	RESISTOR, fixed: comp; JAN type #RC20BF334K; 330,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	V113 screen.	3RC20BF334K
R123, R131, R159, R201, R202, R203, R204, R209, R210, R211, R212	RESISTOR, fixed: comp; JAN type #RC20BF474K; 470,000 ohms ±10%; 1/2 w; 2 axial wire lead term.	R123: V104 grid. R131: V106 grid. R159: V113 grid. R201, R202: Plate load for V123. R203, R204: Plate load for V124. R209, R210: Parts of low-pass filter V123 input. R211, R212: Parts of low-pass filter V124 input.	3RC20BF474K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R225	RESISTOR, fixed: comp; JAN type #RC20BF105K; 1.0 meg ±10%; 1/2 w; 2 axial wire lead term.	V128 grid.	3RC20BF105K
R199, R200	RESISTOR, fixed: WW; JAN type #RW31G162; 1600 ohms ±5%; 10 w at 275° C max continuous oper temp.	R199: V119 and V120 cathode. R200: V121 and V122 cathode.	3RW25509
R165	RESISTOR, variable: ww; 25,000 ohms ±10%; 4 w; at 100° C continuous oper temp; 3 solder lug term.; metal case 1.780" dia x .980" thk, incl; slotted shaft, metal, 1/4" dia x 1/2" lg from mtg surface; linear taper, gnd cont arm, w/o off position; normal torque; bushing 3/8" -32 x 3/8" lg, nonturn device located on 17/32" rad at 9 o'clock; WL to Collins Rad spec #750802700; Collins Rad part/dwg 750802700.	V114 screen voltage control.	3Z7425-136
C126B	ROTOR, capacitor: two plates assembled with hub and switch cam; variable; 1-1/2" lg x 1-1/8" d o/a; Collins Rad part/dwg #504 0648 002.	Motor driven tuning capacitor for m-o.	2Z8066-8
E121	SHIELD, tube: cad pl steel; cylindrical w/1/2" dia hole in top; 1-3/8" lg x .915" max ID, .810" min ID; w/ss spring inside; Johnson EF #278A.	Hold-down shield for V104, V105, V106, V107, V109, V111, V113, V118, V125, V126 and V129.	2Z8304.381
E122	SHIELD, tube: cad pl steel; cylindrical w/1/2" dia hole in top; bayonet mtg; 1-3/4" lg x .915" max ID, .810" min ID; w/ss spring inside; N/A Johnson EF #278B.	Hold-down shield for V108, V110, V112, V127 and V128.	2Z8304.380
E123	SHIELD, tube: cad pl cold rolled steel; cylindrical w/19/32" dia hole in top; bayonet mtg; .950" ID x 1-1/2" lg w/ss spring inside; Cinch #16G12626.	Hold-down shield for V101, V102, V103, V115, V116, V117, V123 and V124.	2Z8304.382
E124	SHIELD, tube: cylindrical w/19/32" dia hole in top; bayonet mtg; .950" ID x 1-15/16" lg inside; w/ss spring inside; Cinch #16G12627.	Hold-down shield for V114, V119, V120, V121 and V122.	2Z8304.137
XV101, XV102, XV103, XV114, XV115, XV116, XV117, XV119, XV120, XV121, XV122, XV123, XV124	SOCKET, tube: Navy type #-491894; 9 cont miniature; one piece saddel mtg 1-11/32" lg; round phenolic body 11/16" lg x .840" dia less cont incl shield; incl metal shield; ctr shield .260" dia; Cinch #53F12875.	XV101: Socket for V101. XV102: Socket for V102. XV103: Socket for V103. XV114: Socket for V114. XV115: Socket for V115. XV116: Socket for V116. XV117: Socket for V117. XV119: Socket for V119. XV120: Socket for V120. XV121: Socket for V121. XV122: Socket for V122. XV123: Socket for V123. XV124: Socket for V124.	2Z8679.30

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
XV104, XV105 thru XV113, XV118, XV125 thru XV129	SOCKET, tube: 7 cont miniature; JAN type TS102PO1; above chassis base mtg; w/3/4" h metal shock shield, ctr shield .095" ID.	XV104: Socket for V104. XV105: Socket for V105. XV106: Socket for V106. XV107: Socket for V107. XV108: Socket for V108. XV109: Socket for V109. XV110: Socket for V110. XV111: Socket for V111. XV112: Socket for V112. XV113: Socket for V113. XV118: Socket for V118. XV125: Socket for V125. XV126: Socket for V126. XV127: Socket for V127. XV128: Socket for V128. XV129: Socket for V129.	2Z8677.94
XY101	SOCKET, tube: Navy type #49384; under chassis wafer mtg; Johnson EF type 237.	Crystal holder for Y101.	2ZK8677.18
O128	SPRING: helical compression type; 7/16" free lg, 1/4" min working lg, .150" ID; 7-1/2 turns; Collins Rad part/dwg #504 0777 001.	Releases disk.	2Z8878-184
C126A	STATOR, capacitor: variable; 1-1/2" lg x 1-1/16" wd x 1" h o/a; Collins Rad part/dwg #504 0561 001.	Motor driven tuning capacitor for m-o.	2Z8890
S104	SWITCH, sensitive: SPDT; 15 amp, 115 v a-c; 1-13/64" lg x 53/64" wd x 9/32" thk o/a; oper pressure 3-6 oz; Acro Elec type 1 MD1-1A.	Cam driven by afc motor.	3Z9823-13
S101, S103, S105	SWITCH, toggle: DPDT; JAN type #ST26N; 1-9/32" lg x 23/32" wd x 2-1/8" h; 11/16" lg bat. type handle.	S101: Plate ON and OFF. S103: Step up-operate. S105: 100-kc EXT-INT.	3Z9863-26N
E113 thru E119	TERMINAL, stud: molded melamine body, terminal brass, tin dipped, insert, brass cad pl; 23/32" lg o/a; 17/32" lg less term; 1/4" diam; #4-40 NC-2 tapped 3/16" d one end, slotted solder lug other end; Whitso Inc. #102-A-1.	E113: Tie point for XV116 and J114-1. E114: Tie point for R155, E116, R144, and K101. E115: Tie point for R242 and J113. E116: Tie point for R157, E114, C155C, C157A, T105 and R167. E117: Tie point for XV114 and J513-1. E118: Tie point for R158, T101-1 and C116C. E119: Tie point for R158, R166, T102-4.	3G350-79
T113	TRANSFORMER, RF: two wdg, single layer wound; 45 turns 1st wnd, 30 turns 2nd wnd, #30 AWG wire; 1-29/32" lg x 1-3/8" wd x 1-1/2" h less term.; 13/16" dia x 13/16" lg; Collins Rad part/dwg #504 1941 003.	R-f output coupling V114 to J108.	2Z9626.89

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
T101, T102, T105	TRANSFORMER, variable, r-f: Navy type #472518; 12 turns #16 wire; 2-1/2" lg x 1-1/8" wd x 1-1/8" thk; Collins Rad part/dwg #504 0658 003.	T101: Plate tank V104. T102: Plate tank V105. T105: Plate tank V115.	2Z9626.88
T103	TRANSFORMER, variable, r-f: Navy type #-472516; 2 pie universal wnd; 300 turns, 150 turns; #36 S wire; 2-1/2" lg x 1-1/8" wd x 1-1/8" thk; Collins Rad part/dwg #504 0663 003.	750-kc output in plate of V106 (including C124).	2Z9626.87
V101, V102, V103, V115, V116, V117, V123, V124	TUBE, electron: JAN-5670.	V101: 100-kc crystal oscillator and amplifier. V102: 50-kc divider. V103: 25-kc divider. V115: 75 to 100 divider. V116: 150 to 200 divider. V117: 300 to 400 divider. V123, V124: D-c amplifiers.	2J5670
V104, V106, V107, V109, V111, V113, V118, V129	TUBE, electron: JAN-6AK5.	V104: First harmonic amplifier. V106: 450-kc amplifier. V107: 100-kc amplifier. V109: First i-f amplifier. V111: Second i-f amplifier. V113: 10-mc to 22.5-mc multiplier. V118: Interpolation buffer. V129: 100-kc amplifier.	2J6AK5
V105	TUBE, electron: JAN-6AS6.	Second harmonic amplifier.	2J6AS6
V108, V110, V112, V127	TUBE, electron: JAN-6BE6.	V108: First i-f mixer. V110: Second i-f mixer. V112: Buffer amplifier. V127: Divider.	2J6BE6
V114, V119 thru V122	TUBE, electron: Arinc type #5686.	V114: 2 to 4.5 multiplier. V119 thru V122: Power amplifier.	2J5686
V125, V126	TUBE, electron: JAN-5726/6AL5W.	Diode mixers.	2J5726/6AL5W
V128	TUBE, electron: JAN-6BA6.	Divider.	2J6BA6

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
1401, 1499 Series	FREQUENCY SHIFT KEYER KY-45/FRT-5: 50-75 wpm speed range; electronically controlled keying; oper power requirements d-c; minus 400 v bias supply plus 600 v low voltage supply 50 mils, bias supply; 100 mils, low voltage supply; aluminum case; zinc chromate; enamel finish; o/a dimen, 19" lg x 15-1/8" w x 10-1/2" h; rack mtd in RF bay; MIL-R-11181 (Sig C) Collins Radio Co.	For keying the AN/FRT-22 transmitter.	2C640-45
M1401	AMMETER: d-c milliameter; range 0 to 5 ma; rectangular phenolic, flush, panel mtg case; 1.317" dia barrel, 2.0625" d, fl 2-1/4" lg x 2-11/32" wd x 7/32" thk; 2% accuracy for full scale reading; calibrated for non-magnetic panel; 50 scale divisions, black markings on white; u/w external shunt; four #4-40 NC-2 x 9/16" lg mtg studs in fl on 1-7/8" x 1-7/8" mt mtg/c; two 11/16" lg 1/4"-28 NF-2 stud term. Wemco #RX33.	V1404 plate and grid meter.	3F8040-8
O1409, O1413	ARM: actuator, SS; #302: 2-1/8" lg x 13/32" h x 0.360" wd o/a; Collins #504 0769 001; ea.	O1409: C1405 drive. O1413: R1458 drive.	2Z379-4
C1455	CAPACITOR, fixed: paper dielectric; .47 uf ±5%; 100 vdcw.	C1455: V1407 grid tuning capacitor.	30A420-38
C1457	CAPACITOR, fixed: paper dielectric, single sect; 500,000 uuf p/m 20%; 600 vdcw; metallic case; 2-1/2" lg x 1" diam case; Dykanol impr; 2 axial wire leads; tangential mtg bkt w/5/32" diam mtg hole; JAN type #CP29A2DF504M.	V1407 grid tuning capacitor.	
C1442	CAPACITOR, variable: air dielectric; plate meshing type single sect. 2.6 to 19.7 uuf 1-11/64" lg x 3/4" h x 5/8" wd excl shaft; shaft .188" dia x 1/4" lg beyond thd, 1/4"-32 NEF-2 x 1/4" lg, locking type; scdr adj; 360° rotation; solder lug term. bushing mtd; Johnson EF type #160-110.	V1411 grid trimmer capacitor.	3D9019VE7
C1419	CAPACITOR, variable: Navy type #-483458; air dielectric; plate meshing single sect. 4 to 50 uuf; 1-9/32" lg x 15/16" wd x 1-7/32" h excl shaft, 1/4" hex. nut on 5/16" lg shaft, locking; scdr adj; 360° rotation; solder lug term. two mtg nuts on front tapped 4-40; RCC type #34.	V1404 plate trimmer capacitor (p/o Z1402).	3D9050V-134
C1406, C1408, C1413	CAPACITOR, variable: ceramic; rotary type, single sect.; 5.0 to 50.0 uuf; 500 vdcw; temp coef minus 650 uuf/uf/°C; 13/32" h x 27/32" lg x 41/64" wd; solder lug term.; two .120" dia mtg holes in base, on .438" mtg/c; scdr slot adj; ceramic base; JAN type #CV11D500.	C1406: Trimmer capacitor plate to plate V1401 and V1402 (p/o Z1405). C1408: V1403 grid trimmer capacitor (p/o Z1404). C1413: V1403 plate trimmer capacitor (p/o Z1403).	3D9045V-22

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C1441, C1447	CAPACITOR, fixed: ceramic; JAN type #CC20PH-100F; 10 uuf ±1 uuf; 500 vdcw.	C1441: V1411 grid tuning capacitor. (Chosen to fulfill requirements of individual oscillator. Use capacitor value found in equipment or as indicated on replacement Z-1401.) C1447: Output coupling capacitor.	3D9010-189
C1441, C1447	CAPACITOR, fixed: ceramic; JAN type #CC20PH-200J; 20 uuf ±5% 500 vdcw.	C1441: V1411 grid tuning capacitor. (Chosen to fulfill requirements of individual oscillator. Use capacitor value found in equipment.) C1447: Output coupling capacitor.	
C1435	CAPACITOR, fixed: ceramic dielectric; JAN type #CC30CH240J; 24 uuf ±5%; uuf/uf^{O}C; 500 vdcw.	Coupling capacitor S1405 common to V1409.	
C1441, C1443	CAPACITOR, fixed: ceramic; JAN type #CC30PG-510J; 51 uuf ±5%; 500 vdcw.	C1441: V1411 grid tuning capacitor. C1443: V1411 grid capacitor.	3D9051-42
C1439, C1444, C1446	CAPACITOR, fixed: ceramic; 100 uuf ±5%; temp coef 0; tol +60 -110 uuf/uf^{O}C; 500 vdcw; 1.165" lg x .315" dia; radial wire leads term. mtg; uninsulated; JAN type #CC35CG101J.	C1439: Coupling capacitor V1410 to V1411. C1444: V1411 grid capacitor. C1446: V1411 plate bypass.	
C1437	CAPACITOR, fixed: mica; JAN type #CM20B101J; 100 uuf ±5%; 500 vdcw.	Coupling capacitor V1409 to V1410.	3K2010122
C1451, V1412	CAPACITOR, fixed: mica; JAN type #CM20B101K; 100 uuf ±10%; 500 vdcw.	Coupling capacitor V1412 plate to other V1412 grid.	3K2010121
C1429	CAPACITOR, fixed: mica; JAN type #CM20B151M; 150 uuf ±20%; 500 vdcw.	Coupling capacitor 200 kc oscillator tank to V1408 grid.	3K2015124
C1428	CAPACITOR, fixed: mica; JAN type #CM20B201J; 200 uuf ±5%; 500 vdcw.	Coupling capacitor 200 kc oscillator tank to V1408 grid.	3K2020122
C1407	CAPACITOR, fixed: mica; JAN type #CM30B681J; 680 uuf ±5%; 500 vdcw.	Part of equalizing network between L1403 and L1405 (part of Z1405).	3K3068122

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C1401, C1403, C1404, C1410, C1411, C1415 thru C1418, C1420, C1421, C1422, C1424, C1425, C1426, C1430 thru C1433, C1436, C1438, C1449, C1452, C1453, C1454	CAPACITOR, fixed: mica dielectric; 10,000 uuf ±20%; 300 vdcw; JAN type CM35B103M.	C1401: Input coupling capacitor. C1403: V1401 screen bypass. C1404: V1402 screen bypass. C1410: V1403 cathode bypass. C1411: V1403 screen bypass. C1415: V1404 grid bypass. C1416: V1404 screen bypass. C1417: V1404 plate bypass (p/o Z1402). C1418: V1404 coupling to keyer output (p/o Z1402). C1420, C1421, C1422, C1424, C1425, C1426: Wave shaping capacitors. C1430, C1431: V1408 bypass. C1432, C1433: Coupling capacitors, V1408 to mixing resistor. C1436: V1409 cathode bypass. C1438: V1410 screen bypass. C1449: Part of low-pass filter, grid V1412. C1452: V1412 plate bypass. C1453, C1454: Coupling capacitors, V1412 to V1401.	3K3510324
C1414	CAPACITOR, fixed: mica; JAN type #CM30B222K; 2200 uuf ±10%; 500 vdcw.	Coupling capacitor V1403 to V1404.	3K3022221
C1423, C1427	CAPACITOR, fixed: mica dielectric; 3300 uuf ±20%; 500 vdcw; JAN type CM30B332M.	Wave shaping capacitors.	3K3033224
C1448, C1450	CAPACITOR, fixed: mica dielectric; 4700 uuf ±20%; 500 vdcw; JAN type CM35B472M.	Part of low pass filter, grid V1412.	3K3547224
C1445A C1445B C1445C	CAPACITOR, fixed: paper dielectric; 100,000 uuf per sect. +40-15%; 600 vdcw; 3 sect.; JAN type CP54B5FF104X.	C1445A: V1411 plate decoupling. C1445B: V1411 screw bypass. C1445C: V1411 plate decoupling.	3DA100-1195

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C1456	CAPACITOR, fixed: paper dielectric; 100,000 uuf ±20%; 600 vdcw; JAN type CP29A1DF104M.	V1407 grid coupling.	3DA100-856
C1402, C1409, C1412	CAPACITOR, fixed: paper dielectric; JAN type #CP29A2DF104M; single sect.; 100,000 uuf ±20%; 600 vdcw.	C1402: V1401 and V1402 cathode bypass. C1409: V1403 grid bypass. C1412: V1403 plate bypass.	3DA100-1024
C1458	CAPACITOR, fixed: paper dielectric: JAN type #CP29A1DF504M; single sect.; 500,000 uuf ±20%; 600 vdcw.	Coupling capacitor V1407 output.	3DA500-791
C1405 ABCDE	CAPACITOR, variable: air dielectric; 5 sect.; sect. #1 402, #2 402, #3 201, #4 201, #5 201 uuf tol ±1% plus 1 uuf ±.5% plus 1 uuf between sect. 6-3/16" lg x 2-13/16" h x 3-3/16" wd excl shaft; shaft 1/4" dia x 1-1/4" lg; extension shaft adj; 180° ±1° ccw. rotation; lug term. Oak model #50.	C1405A: V1401 tuning capacitor. C1405B: V1402 tuning capacitor. C1405C: V1403 grid tuning capacitor. C1405D: V1403 plate tuning. C1405E: V1404 plate tuning.	3D9402V-7
E1409	CLIP: electron tube; ceramic ins; 3/8" opening; 1-1/8" lg x 5/8" wd x 19/32" h o/a; Natl Co #SPP-3.	V1404 plate cap.	2Z2712.1
L1401, L1408, L1410, L1414, L1417	COIL, RF: choke, unshielded; 2-7/32" lg x 7/16" dia; Millen #34102.	L1401: V1401 and V1402 r-f choke. L1408: V1403 r-f choke. L1410: V1404 r-f choke. L1414: V1407 r-f choke. L1417: V1411 r-f choke.	3C341-3
L1402, L1403	COIL, RF: mixer pl; single wnd, single layer wnd ct; unshielded; 42 turns #32 wire; 1" dia approx x 1-5/8" lg o/a; ceramic form, air core; two 6-32 NC-2 holes 3/8" dia ea end; 3" wire term. ea end; Collins Rad part/dwg #504 3402 002.	L1402: V1401 and V1402 RF coil (incl L1403) (p/o Z1405). L1403: Link to L1402 (Integral with L1402) (p/o Z1405).	3C1084S-95
L1404	COIL, RF: equalizer; single wnd, single layer wnd; unshielded; 4.95 mc ±3%, 100 uuf approx 10.3 uf; 3/4" dia approx x 1" lg o/a; bakelite form and core; form 1/4" dia x 1" lg; term. mtd; 1-1/2" wire lead ea end; Collins Rad part/dwg #504 3368 001.	Part of equalizing network in line between L1402 and L1403 (part of Z1405).	C1084S-94
L1405, L1406, L1407	COIL, RF: buffer; single wnd, single layer wnd; unshielded; 42 turns #32 wire; 1" dia approx x 1-5/8" lg o/a; ceramic form, air core; form 3/4" dia x 1-5/8" lg; two 6-32 NC-2 holes 3/8" dia ea end; 3" wire term. ea end; Collins Rad part/dwg #504 3403 002.	L1405: Link to L1406 (Integral with L1406) (p/o Z1404). L1406: Gridcoil of V1403 (incl L1405)(p/o Z1404). L1407: Plate coil of V1403 (p/o Z1403).	3C1084S-93

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
L1409	COIL, RF: choke; 1 wnd, 3 pie, duolateral wnd; 1 mh ±20%, 300 d-c ma, 15 ohm d-c resistance; 2-1/8" lg x 3/8" dia; ceramic form and core; form 1-1/4" lg x 1/4" dia; term. mtg; 2 radial wire leads 2-1/8" lg from ea end; Millen type #34108.	RF choke grid V1404.	3C341-5
L1411	COIL, RF: pwr amplr pl; single wnd, single layer wnd, tapped at 33.5 turns; unshielded; 42 turns #32 wire; 1" dia approx x 1-5/8" lg o/a; ceramic form, air core; form 3/4" dia x 1-5/8" lg; two 6-32 NC-2 holes 3/8" d ea end; 3" wire term. ea end; Collins Rad part/dwg #504 3404 002.	Plate coil of V1404 (p/o Z1402).	3C1084K-121
L1413	COIL, RF: choke; 1 wnd, 4 pie, duolateral wnd; unshielded; 2.5 mh ±20%, 250 d-c ma, 55 ohm d-c resistance; 2-1/8" lg x 3/8" dia; ceramic form and core; form 1-1/4" lg x 1/4" dia; term. mtg; 2 radial wire leads 2-1/8" lg from ea end; Millen type #34103.	RF grid choke for V1408.	3C341-1
L1418, L1419	COIL, RF: choke; 1 wnd, 3 pie universal wnd; unshielded; .1 mh ±5%; 1-1/2" lg x 5/16" dia o/a; powdered iron form and core; form 3/4" lg x 13/64" dia; two #16 AWG 3/8" lg axial copper leads; wire term. coated with Amphenol liquid 912; Collins Rad part/dwg #504 2414 001.	L1418: Part of low-pass filter V1412 input. L1419: Part of low-pass filter V1412 input.	3C315-160
Z1403	COIL, RF: buffer pl; single wnd, single layer wnd; unshielded; 42 turns #32 wire; 3-1/8" lg x 2-1/2" wd x 1-1/8" h o/a; adjustable; scdr adj; four .140" dia mtg holes 2.093" x .781" mtg/c; 5 solder lug term. on bottom; includes 5.0 to 50.0 uuf, 500 vdcw trimmer capacitor; Collins Rad part/dwg #504 3394 002.	Buffer plate (incl C1413, L1407).	3C4029-1
P1402	CONNECTOR, plug: 3 round female cont; pol; 90° angle; 2-1/8" lg x 1-5/8" h x 1-1/8" wd max o/a; cyl metal body; phenolic insert; cable opening 3/4" dia; 3/4"-20 NEF-2 thread uses AN3057-6 cable clamp; AN3108-14S-7S. Collins Rad part/dwg #357 6008 00.	Input cable connector.	2Z3064-66
J1404	CONNECTOR, RECEPTACLE: Navy type #491144; 10 male cont; straight type; Jones HB #P-310-AB.	Power supply input.	2Z7120-12
J1406	CONNECTOR, RECEPTACLE: Navy type #49844; 2 male cont, straight type; GE #2711; ea.	115 v a-c input.	6ZK7799-13
J1401, J1402	CONNECTOR, RECEPTACLE: receptacle UG-290/U.	J1401: External oscillator input. J1402: Keyer output.	2Z7390-290
J1403	CONNECTOR, receptacle: 13 round, female non pol cont; straight; for banana type plug 3-3/16" lg x 1-3/8" wd x 1/8" h less cont; rectangular	Connector to heater oven.	2Z3074-10

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	board; 4 mtg holes on 2-5/8" x 3/4" mtg/c; solder lugs attached to cont; Collins Rad part/dwg #504 3385 001.		
J1405	CONNECTOR, receptacle: 13 banana male non pol cont; straight; silver pl copper and brass head .290" lg x 1/4" dia; 3-3/16" lg x 1-3/8" wd x 1/8" h less cont and solder lugs; rectangular board; 4 mtg holes on 2-5/8" x 3/4" mtg/c; Collins Rad part/dwg #504 3379 001.	Connector on oven heater.	2Z3033-6
J1407	CONNECTOR, receptacle: 3 round, male, pol cont, #16 AWG; straight type; 1-5/16" h x 1-3/16" wd x 1-3/16" lg o/a; cont rated 200 v d-c 150 v a-c 20 amp; cyl aluminum body, sandblast finish, locking; molded bakelite insert; .525" dia cable opening; mtg flange w/four .120" dia holes on 29/32" x 29/32" mtg/c; type #AN3102-14S-7P; Collins Rad part/dwg #357 3018 00.	Key line input.	2Z3023-5
O 1401, O 1403, O 1404	COUPLING, flexible: brass body, silver plated; phosphor bronze disc, round; 1.094" dia x .648" thk o/a; 1/4" dia shaft hole through ctr w/4 setscrews #8-32 thd, 2 on ea hub; Oak #6422-008.	O 1401: Coupler for S1403. O 1403: Coupler for S1405. O 1404: Coupler for R1458.	2Z3270-8
O 1405	DRIVE SUBASSEMBLY: pinned lock shaft; u/w frequency shift keyer; knob shaft with pinion and lock disc attached; pinion 15 teeth, pitch 48, .312PD; 3-17/32" lg x 1/4" dia shaft; 1-5/8" dia disc; Collins Rad part/dwg #504 3425 002.	Lock shaft, pinned.	
XF1401, XF1402	FUSEHOLDER: buss HKP; Collins #265 1002 00.	XF1401: Mounts F1401. XF1402: Mounts F1402.	3Z3282-42.9
F1401, F1402	FUSE, cartridge: lamp, 200 v; Littelfuse #1040.	115 v line fuses.	3Z1926
R1474, R1475	HEATING ELEMENT, electrical: strip type; 115 v, 100 w; single sect.; metal sheath; 6" lg x 1" wd x 1/8" thk; 2 locknut term. two mtg slots 3/8" x 1/4" spaced 5-1/4" c to c; air heater; Watelec type CA-20.	R1474: Heater element for oven heating. R1475: Heater element for oven heating.	6Z5054-84
E1407	INSULATOR, bushing: JAN type NS4W4101.	Feedthru for plate lead from L1410 to plate cap V1404.	3G3542-01.1
E1410, E1411, E1412, E1413, E1414,	KNOB: bar; black bakelite; for .256" dia shaft; two #8-36 NF-2 tapped holes at 90° angle for shaft; one arrow marking; 1-1/8" lg x .750" wd x 11/16" d o/a; brass insert; .531" d shaft hole; Collins Rad part/dwg #508 1103 20.	E1410: Knob for S1409. E1411: Knob for S1402. E1412: Knob for R1430. E1413: Knob for R1485 and S1408. E1414: Knob for S1404.	2Z5822-543

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E1415, E1416, E1417, E1418		E1415: Knob for S1403. E1416: Knob for S1405. E1417: Knob for R1458. E1418: Knob for S1401.	
E1420 thru E1423	KNOB: round; black aluminum; for .188 dia shaft ARC dwg #7199-1-B.	E1420: R1430 lockknob. E1421: R1485 lockknob. E1422: C1405 lockknob. E1423: R1458 lockknob.	2Z5822-291
E1419	KNOB: round; black aluminum; for 1/4" dia shaft Collins #502 6085 002.	Knob for C1405.	2Z5824.123
I 1401 I 1402	LAMP, glow: 110 v to 120 v a-c or d-c, 1/10 w; 1-7/8" lg Littelfuse #200 001.	I 1401: Ovenheat indicator. I 1402: Plate ON indicator.	2Z5889-27
L1412	REACTOR: Navy type #-302715; filter choke; 15 hy, 60 ma ±20%, 0-60 cps; 1600 ohm max; 1500 test v; HS metal case, finished in gray lacquer, inclosed; 2-1/8" h x 1-1/2" lg x 1-1/2" wd; four 3/8" h mtg studs on 1" mtg/c; 2 solder lug term. on bottom; Chi Trans #8998-B.	Part of wave shaping circuit.	3C574K-6
L1420	REACTOR: audio; .0291, .1192, .477 and 1.322 hy w/amp ±5%; 500 v RMS; HS metal case, inclosed; 2-1/16" h x 1-21/32" dia; two #4-40 mtg screws 1.312" mtg/c; 5 solder lug term. on bottom; Thordarson type #T-51519.	Grid coil for V1407.	3C557429-29
R1432	RESISTOR, fixed: WW; JAN #RU3A1R2J; 1.2 ohms ±5%; 1/2 w at 110° C max continuous oper temp.	M1401 meter shunt.	3RU07200
R1411	RESISTOR, fixed: comp; JAN type #RC20BF100K; 10 ohm ±10%; 1/2 w; characteristic letter F; .406" lg x .175" dia.	Part of external oscillator input attenuator.	3RC20BF100K
R1410	RESISTOR, fixed: comp; JAN type #RC20BF120K; 12 ohms ±10%; 1/2 w.	Part of external oscillator input attenuator.	3RC20BF120K
R1409	RESISTOR, fixed: comp; JAN type #RC20BF150K; 15 ohms ±10%; 1/2 w.	Part of external oscillator input attenuator.	3RC20BF150K
R1433	RESISTOR, fixed: comp; JAN type #RC20BF200J; 20 ohms ±5%; 1/2 w.	M1401 multiplier resistor.	3RC20BF200J
R1408	RESISTOR, fixed: comp; JAN type #RC20BF220K; 22 ohms ±10%; 1/2 w.	Part of external oscillator input attenuator.	3RC20BF220K
R1407	RESISTOR, fixed: comp; JAN type #RC20BF270K; 27 ohms ±10%; 1/2 w.	Part of external oscillator input attenuator.	3RC20BF270K
R1406	RESISTOR, fixed: comp; JAN type #RC20BF330K; 33 ohms ±10%; 1/2 w.	Part of external oscillator control input attenuator.	3RC20BF330K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R1405, R1412	RESISTOR, fixed: comp; JAN type #RC20BF390K; 39 ohms ±10%; 1/2 w.	Part of external oscillator input attenuator.	3RC20BF390K
R1404	RESISTOR, fixed: comp; 47 ohms ±10%; 1/2 w; JAN type RC20BF470K.	Part of external oscillator input attenuator.	3RC20BF470K
R1428	RESISTOR, fixed: comp; 47 ohms ±10%; 1 w; JAN type RC30BF470K.	V1404 parasitic suppressor grid.	3RC30BF470K
R1401	RESISTOR, fixed: WW non-inductive; 56 ohms ±10%; 10 w; 1-3/4" lg x 5/16" dia; vitreous enameled; 2 radial tab term. 5/16" lg x 3/16" wd; Lectrohm 1-3/4 E modified.	J1401 terminating resistance.	3Z6005F6-11
R1414, R1420	RESISTOR, fixed: comp; JAN type RC30BF560K; 56 ohms ±10%; 1 w.	R1414: V1401 and V1402 cathode resistor. R1420: Part of equalizing network between L1403 and L1405 (p/o Z1405).	3RC30BF560K
R1403	RESISTOR, fixed: comp; JAN type #RC20BF680K; 68 ohms ±10%; 1/2 w.	Part of external oscillator input attenuator.	3RC20BF680K
R1422	RESISTOR, fixed: comp; JAN type RC30BF680K; 68 ohms ±10%; 1 w.	V1403 cathode resistor.	3RC30BF680K
R1402	RESISTOR, fixed: comp; JAN type #RC20BF820K; 82 ohms ±10%; 1/2 w.	Part of external oscillator input attenuator.	3RC20BF820K
R1476	RESISTOR, fixed: comp; 100 ohms ±10%; 1 w; JAN type RC30BF101K.	V1412 grid resistor.	3RC30BF101K
R1415, R1490	RESISTOR, fixed: comp; 150 ohms ±10%; 1 w; JAN type RC30BF151K.	R1415: V1415 and V1402 cathode resistor. R1490: V1404 screen.	3RC30BF151K
R1442	RESISTOR, fixed: comp; JAN type RC30BF221K; 220 ohms ±10%; 1 w.	Bias resistor across limiter adjust R1439.	3RC30BF221K
R1449, R1451, R1468	RESISTOR, fixed: comp; JAN type RC30BF271J; 270 ohms ±5%; 1 w.	R1449, R1451: Voltage divider in 200 kc input to V1408. R1468: V1410 cathode resistor.	3RC30BF271J
R1465	RESISTOR, fixed: comp; JAN type RC30BF331K; 330 ohms ±10%; 1 w.	V1409 cathode resistor.	3RC30BF331K
R1443, R1444	RESISTOR, fixed: WW, non-inductive; JAN #RB-11B470ROF; 470 ohms ±1%; 1/3 w at 105° C max continuous oper temp.	R1443, R1444: V1408 bias resistor.	3RB4-4700.1
R1435	RESISTOR, fixed: WW; JAN RW30G631; 630 ohms ±5%; 8 w at 275° C max continuous oper temp.	Photo input termination resistor.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R1461, R1462	RESISTOR, fixed: comp (deposited carbon); 900 ohms ±1%; 1 w; 15/16" lg x 9/32" dia; two 1-1/4" lg min axial wire lead term.; h-f application; Wilkor Products, Inc type CP-1.	R1461, R1462: Part of transmitter multiplication control.	3Z6090-45
R1446	RESISTOR, fixed: comp; JAN type RC30BF152J: 1,500 ohms ±5%; 1/2 w.	Wave shaping resistor.	3RC20BF152J
R1460	RESISTOR, fixed: comp (deposited carbon); 1800 ohms ±1%; 1 w; 15/16" lg x 9/32" dia; two 1-1/4" lg min axial wire lead term.; h-f application; Wilkor Products, Inc type CP-1.	Part of transmitter multiplication control.	3Z6180-80
R1423, R1479	RESISTOR, fixed: comp; JAN type RC30BF222K; 2200 ohms ±10%; 1w.	R1423: V1403 bias divider resistor. R1479: V1412 plate load.	3RC30BF222K
R1431	RESISTOR, fixed: comp; JAN type RC42BF272K; 2700 ohms 10%; 2 w.	V1404 screen resistor.	3RC42BF272K
R1436	RESISTOR, fixed: comp; JAN type RC42BF332J; 3300 ohms ±5%; 2 w.	V1406 cathode bias divider resistor.	3RC42BF332J
R1459	RESISTOR, fixed: comp (deposited carbon); 3600 ohms ±1%; 1 w; 15/16" lg x 9/32" dia; two 1-1/4" lg min axial wire lead term.; h-f application; Wilkor Products, Inc type CP-1.	Part of transmitter multiplication control.	3Z6360-16
R1454, R1455	RESISTOR, fixed: comp; JAN type RC30BF392J; 3900 ohms ±5%; 1 w.	R1454, R1455: V1408 cathode resistor.	3RC30BF392J
R1427	RESISTOR, fixed: comp; JAN type RC30BF682J; 6800 ohms ±5%; 1 w.	V1404 bias divider resistor.	3RC30BF682J
R1463 R1473	RESISTOR, fixed: comp; JAN type RC30BF103J; 10,000 ohms ±5%; 1 w.	R1463: V1409 grid resistor. R1473: V1411 plate dropping resistor.	3RC30BF103J
R1491	RESISTOR, fixed: comp; JAN type RC42BF103K; 10,000 ohms ±10%; 2 w.	Improve voltage regulation in power supply.	3RC42BF103K
R1483	RESISTOR, fixed: comp; 10,000 ohms ±10%; 1 w; JAN type RC30BF103K.	V1412 voltage dropping resistor.	3RC30BF103K
R1456, R1457	RESISTOR, fixed: comp; JAN type RC30BF123J; 12,000 ohms 5%; 1 w.	R1456, R1457: V1408 plate load.	3RC30BF123J
R1472	RESISTOR, fixed: comp; JAN type RC30BF123K; 12,000 ohms ±10%; 1 w.	V1411 screen dropping resistor.	3RC30BF123K
R1424, R1426	RESISTOR, fixed: comp; JAN type RC30BF153J; 15,000 ohms ±5%; 1 w.	R1424: V1403 bias divider resistor. R1426: V1404 bias divider resistor.	3RC30BF153J
R1421	RESISTOR, fixed: comp; JAN type RC30BF153K; 15,000 ohms ±10%; 1 w.	V1403 grid resistor (part of Z1404).	3RC30BF153K

7. Identification Table of Parts for Frequency Shift Keyer KY-45/FRT-5 (contd)

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R1478, R1480	RESISTOR, fixed: comp; 22,000 ohms ±10%; JAN type RC30BF223K.	R1478: V1412 plate load. R1480: V1412 plate load.	3RC30BF223K
R1419	RESISTOR, fixed: comp; 22,000 ohms ±10%; 2 w; JAN type RC42BF223K.	V1401 and V1402 plate voltage dropping resistor.	3RC642BF223K
R1437, R1467, R1486	RESISTOR, fixed: comp; JAN type RC30BF223J; 22,000 ohms ±5%; 1 w.	R1437: V1407 cathode bias divider resistor. R1467: V1410 grid resistor. R1486: V1407 grid resistor.	3RC30BF223J
R1438	RESISTOR, fixed: comp; JAN type RC42BF223J; 22,000 ohms ±5%; 2 w.	Voltage dropping in plus 150-volt line to S1403B.	3RC42BF223J
R1477	RESISTOR, fixed: comp; 27,000 ohms ±10%; 1 w; JAN type RC30BF273K.	V1412 grid resistor.	3RC30BF273K
R1417, R1418	RESISTOR, fixed: comp; JAN RC42BF273K; 27,000 ohms ±10%; 2 w.	R1417, R1418: V1401 and V1402 screen dropping resistor.	3RC42BF273K
R1425, R1466	RESISTOR, fixed: comp; 33,000 ohms ±10%; 1 w; JAN type RC30BF333K.	R1425: V1403 screen resistor. R1466: V1409 plate voltage dropping resistor.	3RC30BF333K
R1487	RESISTOR, fixed: comp; JAN type RC42BF393J; 39,000 ohms ±5%; 2 w.	V1407 plate and screen resistor.	3RC42BF393J
R1447	RESISTOR, fixed: comp; JAN type RC30BF563J; 56,000 ohms ±5%; 1 w.	Terminating resistor for wave shaping.	3RC30BF563J
R1481, R1482	RESISTOR, fixed: comp; JAN type RC30BF563K; 56,000 ohms ±10%; 1 w.	R1481, R1482: V1402 mixer grid.	3RC30BF563K
R1413	RESISTOR, fixed: comp; 68,000 ohms ±10%; 1 w; JAN type RC30BF683K.	V1401 and V1402 grid resistor.	3RC30BF683K
R1452, R1453, R1488	RESISTOR, fixed: comp; 82,000 ohms ±10%; 1 w; JAN type RC30BF823K.	R1452: V1408 grid resistor. R1453: V1408 grid resistor. R1488: I 1402 voltage dropping resistor.	3RC30BF823K
R1470	RESISTOR, fixed: comp; 100,000 ohms ±10%; 1 w; JAN type RC30BF104K.	V1410 plate resistor.	3RC30BF104K
R1440, R1441, R1448	RESISTOR, fixed: comp; JAN type RC30BF104J; 100,000 ohms ±5%; 1 w.	R1440: Wave shaping resistor plate #7 V1406. R1441: Wave shaping resistor plate to plate V1406.	3RC30BF104J

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		R1484: V1407 grid resistor.	
R1471	RESISTOR, fixed: comp; JAN type RC30BF154J; .15 meg ±5%; 1 w.	V1411 grid resistor.	3RC30BF154J
R1445	RESISTOR, fixed: comp; JAN type RC30BF224J; 220,000 ohms ±5%; 1 w.	Wave shaping resistor.	3RC30BF224J
R1489	RESISTOR, fixed: comp; JAN type RC30BF274K; 270,000 ohms ±10%; 1/2 w.	Part of transmitter multiplication control.	3RC20BF274K
R1469	RESISTOR, fixed: comp; 330,000 ohms ±10%; 1 w; JAN type RC30BF334K.	V1410 screen resistor.	3RC30BF334K
R1434	RESISTOR, fixed: comp; JAN type RC30BF474K; 470,000 ohms p/m ±10%; 1 w.	Key line input termination resistor.	3RC30BF474K
R1450	RESISTOR, variable: WW; JAN #RA20A1SG500AK; 50 ohms ±10%; 2 w, at 100°C max continuous oper temp.	Keyer balance control in 200 kc input to V1408.	3RA3018
R1464	RESISTOR, variable: WW; JAN #RA20A1SG252AK; 2,500 ohms ±10%; 2 w, at 100°C max continuous oper temp.	Frequency shift cal control cathode V1409.	3RA6329
R1485	RESISTOR, variable: WW; JAN #RA20B1RH502AJ; 5000 ohms ±5%; 2 w, at 100°C max continuous oper temp.	Phase modulation control (includes S-1408).	3RA6941
R1439, R1448	RESISTOR, variable: WW; JAN #RA20A1SD402AK; 5,000 ohms ±10%; 2 w, max continuous oper temp 100°C.	R1439: V1406 cathode limiter adjustment. R1448: Photo adjustment.	3RA6923
R1458	RESISTOR, variable: comp; 10,000 ohms ±10%; 2 w; 3 solder lug term.; plastic metal case w/ cover 1-3/32" dia x 19/32" d max; rounded shaft, 1/4" dia x 1-1/2" lg from mtg surface; lin taper; bushing 3/8" -32 NEF-2 x 3/8" lg, AB #J 26330.	Frequency shift control.	3Z7410-123
R1416	RESISTOR, variable: WW; JAN type RA20A1SD103-AK; 10,000 ohms ±10%; 2 w, at 100°C max continuous oper temp.	V1401 and V1402 modulator balance screen resistor.	3RA7519
R1430	RESISTOR, variable: WW; 25,000 ohms ±10%; 4 w at 100°C max continuous oper temp; 3 solder lug term.; metal case 1.780" dia x 1-1/4" d; slotted shaft, metal, 1/4" dia x 1-1/2" lg from mtg surface; lin taper; bushing 3/8" -32 NEF-2 thd x .375" lg, nonturn device located on .531" radius at 9 o'clock; Collins Rad part/dwg #750 8026 00.	V1404 screen pot.	3Z7425-102
E1426	SHIELD, tube: cylindrical, bayonet mtg; Cinch #16G12627.	Hold-down shield for V1408 and V1412.	2Z8304.137
E1424	SHIELD, tube: JAN type TS102UO2.	Hold-down shield for V1401, V1402, V1403, V1409, V1410 and V1411.	2Z8304.276

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E1425	SHIELD, tube: JAN type TS102UO1.	Hold-down shield for V1405, V1406 and V1407.	2Z8304.57
XV1404	SOCKET, electron tube: Navy type #49363; 5 cont small; Johnson #225.	Mounts V1404.	2Z8763
XV1401, XV1402, XV1403, XV1405, XV1406, XV1407, XV1409, XV1410, XV1411	SOCKET, electron tube: 7 cont miniature.	XV1401: Mounts V1401. XV1402: Mounts V1402. XV1403: Mounts V1403. XV1405: Mounts V1405. XV1406: Mounts V1406. XV1407: Mounts V1407. XV1409: Mounts V1409. XV1410: Mounts V1410. XV1411: Mounts V1411.	2Z8677.94
XV1408, XV1412	SOCKET, electron tube: Navy type #491894; 1 pc saddle mtg; Cinch #53F12875.	XV1408: Mounts V1408. XV1412: Mounts V1412.	2Z8679.16
S1403AB	SWITCH, rotary: 5 position; Collins Rad part/dwg #259 0361 00.	Test operate switch.	3Z9825-50.12
S1401	SWITCH, rotary: 1 pole, 11 position (11 throws); single sect.; spring brass silver pl cont; ceramic stators and rotors; 1-21/32" wd x 1-7/8" h x 1" lg o/a; shorting type cont; solder lug term.; single hole mtg bushing 3/8-32 NEF-2 x 3/8" lg, 1/4" dia x 7/8" lg shaft, flush mtg; Collins Rad part/dwg #259 0365 00.	External oscillator input attenuator switch.	3Z9825-92.16
S1402	SWITCH, rotary: 3 pole, 2 position 2 throws; single sect.; spring silver alloy cont; ceramic rotor and stators; 1-7/8" h x 1-21/32" wd x 1-1/4" lg body o/a; shorting type cont; solder lug term. single hole bushing 3/8-32 NEF-2 x 3/8" lg, 1/4" dia x 7/8" lg shaft, flush mtg; Collins Rad part/dwg #259 0368 00.	Meter switch.	3Z9825-92.19
S1404 ABC	SWITCH, rotary: 3 pole, 4 position (4 throws); 2 sect.; spring brass silver pl cont; ceramic stators and rotors; 1-21/32" wd x 1-7/8" h x 1-3/8" lg o/a; shorting type cont; solder lug term.; single hole mtg bushing 3/8-32 NEF-2 x 3/8" lg, 1/4" dia x 7/8" lg shaft, flush mtg; Collins Rad part/dwg #259 0366 00.	Wave shaping switch.	3Z9825-92.20
S1405	SWITCH, rotary: 1 pole, 4 position 4 throws; single sect.; spring silver alloy cont; ceramic stators and rotors; 1-21/32" wd x 1-7/8" h x 1-1/8" lg body o/a; shorting type cont; solder lug term.; single hole mtg bushing 3/8-32 NEF-2 x 3/8" lg, 1/4" dia x 1-1/2" lg shaft, flush mtg; Collins Rad part/dwg #259 0367 00.	Transmitter multiplication switch.	3Z9825-92.15

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
S1409	SWITCH, rotary: 3 pole, 2 position; 1 sect.; 6 spring silver alloy cont; steatite ceramic body; 1-1/8" lg x 1-7/8" h x 1-21/32" wd o/a; solder lug term.; 3/8"-32 NEF-2 x 3/8" lg mtg bushing, shaft 7/8" lg x 1/4" dia; Oac type HC.	Plate ON-OFF switch.	3Z9903E-13.21
S1406	SWITCH, thermostatic: cont arrangement 1B; 69°C (156.2°F) +3°C -0° closes, 73°C (159.8°F) +0°C -3°C opens; .75 amp, 115 v a-c or d-c, 2.0 amp, 12.5 v a-c or d-c; metal body; 53/64" lg x 19/32" wd x 5/16" h o/a; shorting type cont; lug term.; four 1/16" dia mtg holes 7/16" x 25/32" mtg/c; Stevens Mfg Co type #CM.	Thermostat 70 degrees in oven.	3Z9695-17.4
S1407	SWITCH, thermostatic: SPST; .75 amp, 115 v a-c or d-c, 2.0 amp, 12.5 v a-c or d-c; metal case; 13/16" lg x 19/32" wd x 1/4" thk o/a; shorting type cont; lug term.; four 1/16" dia mtg holes 7/16" x 25/32" mtg/c; Stevens Mfg Co type #CM.	Thermostat 90 degrees operates in case of failure of S1406.	3Z9695-17.5
Z1401	TRANSFORMER, variable RF: pri and secd wdg; shielded; 200 turns of #36 DE wire, 5-1/2 turns ea side of tap of #36 SSE wire; 2.625" lg x 1.750" dia o/a; iron form, air core; 1-1/2" lg x 13/16" dia coil form; three #6-32 x 1/2" lg PH mtg screws equally spaced on .562" radius; 5 solder lug term. on top; HS in can; Collins Rad part/dwg #504 2789 003.	200 kc (includes C1440, L1415, L1416).	3C1080-11N
V1405, V1406	TUBE, electron: JAN-6AL5W.	V1405, V1406: Limiter.	2J6AL5W
V1401, V1402	TUBE, electron: JAN type 6BE6.	Balance modulators.	2J6BE6
V1403, V1410, V1411	TUBE, electron: JAN type 6BA6.	V1403: Buffer. V1410: Phase shifting amp. V1411: 200 kc oscillator.	2J6BA6
V1404	TUBE, electron: JAN type 807.	Power amplifier.	2J807
V1408	TUBE, electron: JAN type 12AU7.	Balance keyer.	2J12AU7
V1412	TUBE, electron: JAN type 12AX7.	Phase invertor.	2J12AX7
V1407	TUBE, electron: JAN 5654/6AK5W.	Phase modulator oscillator.	2J5654/6AK5W
V1409	TUBE, electron: JAN-6C4.	Phase shifting amplifier.	2J6C4

8. Identification Table of Parts for R-F Oscillator O-270/FRT-26

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
1101-1199	RF OSCILLATOR O-270/FRT-26: 2.0 to 4.5 mc, 1 band, 10 xtal controlled channels; power output 2 w; Pierce ckt, xtal controlled; a-c, 110 v 50-60 cyc, single ph, 20 w, d-c, 600 v thru 6300 ohm resistor, 50 mils; integral coils; 19" lg x 10-13/16" wd x 5-1/4" h; rack mtd; remote controlled from transmitter; MIL-R-11181 (Sig C); Collins Rad; p/o general purpose Radio Transmitting Set AN/FRT-22.		2C2709-92
M1101	AMMETER: d-c; range 0-1 ma; sq, black phenolic flush mtg case; 2-13/64" dia barrel, 1" d behind fl, 2-3/8" lg x 2-3/8" wd x 5/32" d; ±2% accuracy for full scale reading; 100 ohms resistance, 50 mv drop; calibrated for nonmagnetic panel; 30 scale divisions, black markings on white background, window in top of case for illumination; self-contained; four #4-40 NC-2 mtg studs on back of fl spaced 1-7/8" c to c; 2 screw type term. #8-32 NC-2, 17/32" lg; Weston model 506.	V1101 and V1102 cathode current.	3F901E5-20
	BASE, crystal oven: 3" x 3-1/4" x 1-9/16" approx o/a; Collins Rad #503 8551 002.		2Z570-21
C1111	CAPACITOR, fixed: ceramic dielectric; 3 uuf ±1/2 uuf; 500 vdcw, JAN type #CC20CJ030D.	V1101 feedback.	3D9003-48
C1116	CAPACITOR, fixed: paper dielectric; 50,000 uuf ±10%; 600 vdcw; JAN type #CP54B1FF503K.	V1102 cathode bypass.	3DA50-384
C1120	CAPACITOR, fixed: paper dielectric; 4 uf p/m 20%; 600 vdcw; 330 vacw; HS metal case, 2-1/2" lg x 1-3/16" wd x 2-1/2" h less term and mtg; oil impr; two solder lug term on top of case spaced 1-1/2" c to c; mtg plate w/two 7/32" lg x 5/32" wd slots spaced 2-3/4" c to c; Collins Rad part/dwg #930 6214 00.	Phase splitting for motor B1101.	
C1119	CAPACITOR, fixed: mica dielectric; 4700 uuf ±20%; 500 vdcw; JAN type #CM35B472M.	M1101 bypass.	3K3547224
C1114, C1117, C1118	CAPACITOR, fixed: mica dielectric; 10,000 uuf ±20%; 300 vdcw; JAN type CM35B103M.	C1114: V1101 screenbypass. C1117: Coupling V1102 output to output jack. C1118: V1102 plate and screen bypass.	3K3510324
C1115	CAPACITOR, fixed: mica dielectric; 1000 uuf ±20%; 500 vdcw; JAN type #CM30B102M.	C1115: Coupling V1101 to V1102.	3K3010224
C1112	CAPACITOR, fixed: ceramic dielectric; 100 uuf ±10%; 500 vdcw; Collins Rad #916 5097 00.	V1101 feedback.	3D9100-347

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C1101 thru C1110	CAPACITOR, variable: ceramic; rotary type, single sect.; 2.5-13.0 uuf; 500 vdcw; 57/64" lg x 21/32" wd x 3/8" h; solder lug term.; two .120" dia mtg holes on front w/.445" mtg/c; scdr slot adj; steatite base; Erie type TS2A.	C1101 thru C1103: Frequency adjusting trimmers. C1104 thru C1110: Trimmers.	3D9013V-12
L1101, L1102	COIL, RF: choke; unshielded; 1-15/16" lg x 1/2" dia o/a; National R-100S.	L1101: V1101 r-f grid choke. L1102: V1101 r-f cathode choke.	3C326-100.2
T1102	COIL, RF: Navy type 472507; choke, unshielded; 1-3/8" lg x 5/16" dia o/a; 280 uh ±10%, 200 turns, tapped at 152 uh; Collins Rad #503 9531 002.	R-f output cathode V1102.	3C315-161
L1103, L1104	COIL, RF: choke; single layer wdg; unshielded; 34.0 uh, 145 max turns #35 AWG E copper wire; 1" lg x .270" dia o/a; phenolic form; two 1-1/2" term. mtg; 2 axial wire lead term.; Jeffers Electronics #CFI-1/4 140/35.	L1103: V1101 r-f plate choke. L1104: V1102 r-f grid choke.	3C323-192Q
P1102	CONNECTOR, plug: 9 round female cont; straight; 2-3/16" lg x 1-23/64" OD; 10 amp cont rating; cylindrical aluminum tin pl body; molded phenolic insert; 21/32" dia cable opening; knurled coupling ring; Cannonelec catalog #GK-9-21C-5/8.	D-c input and external metering.	2Z3070-68
P1104	CONNECTOR, plug: 20 female cont; straight type; 2-3/32" lg x 13/16" wd x 13/32" h excluding cont; 7.5 amp, 750 v AC RMS; rectangular, black phenolic body, brass silver pl cont; phenolic insert; two 1/8" diam mtg holes spaced 1.842" c to c; Cinch #54A-14516.	Connects J1101.	
J1102	CONNECTOR, receptacle: 9 round male pol cont; straight; 1" dia x 21/32" lg less cont; 10 amp cont rating; cylindrical aluminum tin pl body; molded phenolic insert; sq mtg fl w/four .169" dia mtg holes spaced on 1.193" x 1.193" mtg/c; Cannonelec type K, catalog #GK-9-32-SL.	J1102: D-c input and external metering.	2Z3055-59
J1103	CONNECTOR, receptacle: Jack UG-291/U; Collins Rad #357 9047 00.	R-f output.	2Z3062-167
J1104	CONNECTOR, receptacle: 20 round male cont; straight; 1-31/32" lg x 3/4" wd x 5/16" h less cont; 7.5 amp, 700 v AC RMS; rectangular, black phenolic body, brass silver pl term; phenolic insert; two 1/8" diam holes spaced 1-23/32" c to c; Collins Rad part/dwg #372 1037 00.	Connects S1104 to B1101.	
J1101	CONNECTOR, receptacle: Navy type #49844; straight type; 2 male cont; GE #2711.	115 v a-c input.	6ZK7799-13
Y1101 thru Y1110	CRYSTAL UNIT CR-27/U.	Y1101: Frequency control.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		Y1102 thru Y1110: Crystal units.	
F1101	FUSE, cartridge: Navy type #28053-1/4; 1/4 amp, blowing time, life at 110%, 1 hour at 135%, 5-60 s at 200% load; 250 v; 1 time; glass body; ferrule term.; 1-1/4" lg x 1/4" dia o/a; Littelfuse #1264.	Crystal heater fuse.	3Z2587
XF1101	FUSEHOLDER: Buss HKP; Collins Rad #265 1002 00.	Fuseholder.	3Z3282-42.9
O1101, O1102	GEAR: spur; bright alloy finish brass; straight teeth; 60 teeth, 20° pitch arc; diametral pitch 32, PD 1.875"; 1-15/16" dia .250" ID x 7/16" thk x 1/8" face wd straight face; 3/4" dia x 5/16" thk hub; two #8-36 NF-2 tapped holes at 90° in hub; Collins Rad part/dwg #503 8582 002.	Drive gears for S1102B.	2Z4872-190
O1103	GEAR: spur; bright alloy finish brass; straight teeth; 60 teeth; diametral pitch 32, PD 1.875; 1-15/16" dia x .437" lg o/a; straight face wd .125"; 3/4" dia x 5/16" thk hub; single 1/4" dia hole in ctr; Collins Rad part/dwg #503 8583 002.	Idler gear.	2Z4878-1243
R1101, R1111	HEATING ELEMENT, electrical: coil type; single sect.; rectangular metal form; 2-1/4" lg x 2-3/4" wd x 1-11/16" h less wire leads; 3 wire term. extending from side of shield to 1-5/8" above top of shield; crystal oven heater shield assy; incl bimetallic thermostat closed at 77° C, open at 82° C; p/o Collins Rad #503 8570 003 crystal oven; Collins Rad part/dwg #503 8556 002.	R1101: Crystal oven heater (includes S1101 and R1111), p/o Z1101. R1111: Crystal oven heater (integral with R1101), part of Z1101.	6Z5054-85
E1101 thru E1108, E1112, E1113	INSULATOR, stand-off: grade L-5 ceramic; 5/8" lg; Centralab #2 x 783.	E1101: Tie point for J1103 and C1117. E1102: Tie point for C115 and L1104. E1103: Tie point for terminal #8, V1102, C1118, R1106, and R1107. E1104: Tie point for R1106, and L1103. E1105, E1106: Bracket support for C1106, C1107, C1108, C1109 and C1110. E1107, E1108. Bracket support for C1101, C1102, C1103, C1104, and C1105. E1112, E1113: Tie points for K1101.	3G350-128
E1109, E1110	KNOB: round; black phenolic; for 1/4" dia shaft; 1-3/4" dia x 7/8" d; Collins Rad #503 2377 002.	Knobs for S1103.	2Z5824.131

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
I 1101	LAMP, glow: 100 v to 120 v a-c or d-c, 1/10 w; 1-7/8" lg; Littelfuse #200 001.	Failure indicator.	2Z5889-27
I 1102, I 1103	LAMP, incandescent: 6.3 v, .15 amp; bulb T-3-1/4 clear; 1-1/8" lg o/a; miniature bayonet base; tungsten filament; burn any position; GE type #47 to Collins Rad spec 262 3240 00.	I 1102: Oscillator filament pilot. I 1103: Crystal heater indicator.	2Z5952
XI 1102 XI 1103	LAMP HOLDER: miniature bayonet, amber; metal body w/bakelite ins; 2-1/8" lg x 13/16" dia; mtg hole 11/16"-27 NS-2; 2 solder lug term. located on bottom; Dialco type PLN-844.	XI 1102: Holder for I 1102. XI 1103: Holder for I 1103.	2Z5883-213
K1101	RELAY, armature: cont arrangement left 1A; cont rating .7 amp at 115 v AC, 55 uh inductive load; silver cont 1/8" diam; single wnd, 115 v DC nom oper v; 100 milliohm max DC resistance; solder lug term; 1-11/16" lg x 1.022" wd x 1.365" h o/a; four #4-40 NC-2 x .090" tapped holes on .503" x .378" mtg/c; duty cycle 3 sec ON, 12 sec OFF; humidity and fp; Collins Rad part/dwg #410 0105 00.	Door operated grounding switch.	
R1102	RESISTOR, fixed: WW; 900 ohms ±1%; 1/2 w; MIL type RB17K900ROF.	M1101 Multiplier.	3RB4-9000.3
R1113	RESISTOR, fixed: comp; 10 ohms ±10%; 2 w; JAN type #RC42BF100K.	K1101 filter.	3RC42BF100K
R1112	RESISTOR, fixed: comp; 47 ohms ±10%; 2 w; JAN type #RC42BF470K.	I1103 voltage dropping.	3RC42BE470K
R1104	RESISTOR, fixed: comp; 82 ohms ±10%; 1 w; JAN type #RC30BF820K.	Oscillator cathode (V-1101).	3RC30BF820K
R1109, R1415, R1490	RESISTOR, fixed: comp; 150 ohms ±10%; 1 w; JAN type #RC30BF151K.	R1109: V1102 buffer cathode. R1415: V1401 and V1402 cathode resistor. R1490: V1404 screen.	3RC30BF151K
R1106	RESISTOR, fixed: comp; 5600 ohms ±10%; 2 w; JAN type #RC42BF562K.	V1101 plate load.	3RC42BF562K
R1107, R1425, R1466	RESISTOR, fixed: comp; 33,000 ohms ±10%; 1 w; JAN type #RC30BF333K.	R1107: V1101 screen dropping. R1425: V1403 screen resistor. R1466: V1409 plate voltage dropping resistor.	3RC30BF333K
R1103, R1108	RESISTOR, fixed: comp; 47,000 ohms ±10%; 1 w; JAN type #RC30BF473K.	R1103: Oscillator grid (V1101). R1108: Buffer grid (V-1102).	3RC30BF473K

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R1110	RESISTOR, fixed: WW, noninductive; 6.710 ohms ±1%; 1/2 w; 1" lg max x 27/32" dia; 2 solder lug term. .375" lg x .016" thk; MIL #RB17K6R710F.	M1101 shunt.	3RB2-6710
R1105	RESISTOR, fixed: WW, noninductive; 71.40 ohms ±1%; 1/2 w; 2 solder lug term. .375" lg x .016" thk; MIL #RB17K71R40F.	M1101 shunt.	3RB-7140.1
E1111	SHIELD, tube: cylindrical; bayonet mtg; 1-3/8" lg x .915" max ID x .810" min ID; Johnson EF-278A.	V1101 hold-down shield.	2Z8304.381
XY1101 thru XY1110	SOCKET, crystal: Navy type #-492008; for CR-7 type crystal; steatite body, cad pl phosphor bronze cont; oval body; 7/8" lg x 3/8" wd x 11/16" h o/a; above chassis mtg, one 1/8" dia mtg hole on ctr lines; MILLEN type #33302.	XY1101: Mounts Y1101. XY1102: Mounts Y1102. XY1103: Mounts Y1103. XY1104: Mounts Y1104. XY1105: Mounts Y1105. XY1106: Mounts Y1106. XY1107: Mounts Y1107. XY1108: Mounts Y1108. XY1109: Mounts Y1109. XY1110: Mounts Y1110.	2Z8761-22
XZ-1101A, XZ-1101B, XZ-1101C	SOCKET, crystal: Navy type #49584; ceramic body, beryllium copper cont; for crystal w/two .125" dia term. spaced .500"; 1-3/8" lg x 15/32" wd x 3/4" h o/a; two .140" dia holes on 1.093" mtg/c, above chassis mtg; Millen catalog #33202.	For crystal oven mounting.	2Z8761-20
XV1102 XV1103 XV1104	SOCKET, tube: Navy type 49367; octal; Johnson EF #228.	XV1102: Mounts V1102. XV1103: Mounts V1103. XV1104: Mounts V1104.	2Z8678.29
K506	SOLENOID, rotor solenoid; nom vdcw 115 v; coil resistance 75 ohms ±75%; 2-7/8" lg x 1-3/4" wd x 1-7/8" h o/a; Collins Rad 410 0093 00.	IPA antenna network shorting.	2Z8802-36
O 1104	SWITCH, rotary: rotary sw detent assy; c/o shaft; bushing, spring, 30° detent; SS, plain, or cad pl; rotation li[illegible]ted to 12 positions, no stops; 8-1/4" lg x 1-9/[illegible]" OD; 1" lg shaft w/mtg bushing 3/8"-32 NF-2 x 1/2" lg from mtg surface, 2 holes to pass #5 screw spaced 1.562" c to c located on detent plate; Oak type H.	Detent position S1102.	3Z3345-9
S1103	SWITCH, rotary: 2 ckt, 2 pole, 3 position; spring silver alloy clips, coin silver alloy rotor blades; 11/16" wd x 1-21/32" h x 1-7/8" lg; nonshorting type cont; solder lug term.; single hole mtg, bushing 3/8"-32 x 3/8" lg, shaft 1/4" dia x 7/8" lg FMS, flush mtg; Oak type MC.	Metering.	3Z9825-62.580

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
S1101	SWITCH, thermostatic: cont arrangement 1B; 77° C (170.6° F) plus 2.5° C closes, 82° C (179.6° F) minus 2.5° C opens; 2.0 amp at 12.5 v a-c or d-c .75 amp 115 v a-c or d-c; metal housing; 53/64" lg x 13/16" wd x 5/16" thk o/a; two .104" dia mtg holes 5/8" c to c in cad pl brass mtg strip; bimetallic; Stevens Mfg. Co. type #CM special.	Crystal oven thermostat (part of R1101).	3Z9695-17.3
S1102A	SWITCH SECTION, rotary: incl sw rotor and 10 xtal sockets mtd on plate; isolantite wafer; single ckt, 11 position; oval shape; 3-7/16" lg x 3" wd x 1-1/4" thk o/a; two 9/64" dia mtg holes spaced 1.562" c to c; Collins Rad part/dwg #503 8571 003.	Crystal selector (includes XY1101 through XY1110), part of Z1101.	3Z9903E-22.4
S1102B	SWITCH SECTION, rotary: steatite stator, coin silver alloy rotor blades, spring silver alloy clips; 1 circuit, 1 pole, 12 position, non-shorting type; oval shape; 1-5/16" lg x 1-1/4" wd x 1/8" thk; two holes to pass #4 screw spaced 1.031" c to c, ctr mtg hole to fit .250" x .186" shaft; Oak type F.	Crystal trimmer selector.	
S1104	SWITCH SECTION, rotary: steatite stator, coin silver alloy rotor blades; 1 circuit, 1 pole, 12 position, shorting type; 1-7/8" lg x 1-5/8" wd x 3/16" thk; two holes to pass #5 screw spaced 1.562" c to c, ctr mtg hole to fit 1/4" diam shaft w/flats; Oak type HC.	Part of automatic channel selector.	
T1101	TRANSFORMER, power: filament type; input pri #1, 110 v, 120 v, pri #2, 110 v, 120 v, 50/60 cps; 2 output wdg; secd #1, 6.3 v at 1.0 amp, secd #2, 12.6 v at 2.0 amp; 2500 v test; inclosed metal case; 3-1/2" lg x 2-13/16" wd x 3-3/4" h less term.; ten #8-32 NC-2 x 1/2" lg stud term. on bottom of case; fl mtg w/six .190" dia holes spaced on 3-1/8" x 1" x 1" mtg/c; Chi Trans type #14418 mod.	Crystal heater and filament supply.	2Z9621B-97
V1101	TUBE, electron: type 6AK5.	Crystal oscillator.	2J6AK5
V1102	TUBE, electron: type 6AG7.	Buffer.	2J6AG7
V1103, V1104	TUBE, electron: type OB3/VR-90.	Voltage regulators.	2JOB3/VR-90

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
1501-1599	RF AMPLIFIER AM-738/FRT-22: 4.0 mc to 26.5 mc; output data, 40 kw, 600 ohms balanced; input data, 8 kw, 100-200 ohms; oper power requirements 230 v a-c, 50-60 cyc, 3 ph, 70 kw; 5500 v d-c, 12 amp; sheet steel cabinet; 43" lg x 54-1/4" wd x 91-9/16" h o/a; mts in metal cabinet; var tuning; MIL-R-11181 (Sig C); Collins Rad.	Radio-frequency amplifier.	2C449-350
Z1502, Z1503, Z1504	AMPLIFIER, servo: input 100 v, 50/60 cps, single ph; 1 input channel; output impedance 18,000 ohms plate to plate; metal chassis; 12-1/4" lg x 4-7/16" wd x 2-5/8" h o/a; Collins Rad part/dwg #505 6610 004.	Servo Control amplifier.	2C311-1
O1566, O1568	ARM: actuator; SS type #303; 3-9/16" lg x .500" wd x 11/32" h o/a; single .253" diam mtg hole on one end; Collins Rad part/dwg #505 8056 002.	O1566: Operates S-1518 and S1519. O1568: Operates S1516 and S1517.	
O1581, O1582, O1583, O1584	BEARING, ball: single row radial; two shield; .187" bore, .5000" OD, .1969" thk; 7 balls; lubricated w/AN-G-25 grease; std fit; ABEC-1 std tol; ND-SS-77-R-3X.	O 1581, O 1582: B1504 motor gear assembly. O 1583, O 1584: B1505 motor gear assembly.	
O1586	BEARING, ball: double row radial; two shields; light duty; .3937" bore, 1.1811" OD, 9/16" wd; 18 balls; packed with AN-G-25 grease; std fit; ABEC-1 std tol; ND #55500X1E.	Supports crank for S1520.	
B1501A	BELT, V: 3/8" wd inside, 1/2" wd outside, 9/32" thk, 35" lg outside; Browning type FHR133; for 50 cps operation.	Part of blower B1501 (for 50 cps operation).	6Z879-37
B1501A B1501A (alt)	BELT, V: comp; .3" wd inside, .5" wd outside, 9/32" thk, 35" lg inside, 37" lg outside; 5 cord single row; Browning type FHP 135; for 60 cps operation.	B1501A: Part of blower B1501. (for 60-cps operation). B1501A: Part of blower B-1501 (alternate).	2Z601-6
B1501	BLOWER: centrifugal vane; electric motor operated; 12-1/4" diameter wheel, 58 blades; nonportable; unguarded; motor 1-1/2 hp, 50 cyc 3 phase 220v; 25-3/4" lg x 26-3/4" wd x 25-7/8" h o/a; adj intake; single speed 1250 rpm; belt drive; 3/8" wd pulley; clockwise bottom angular upblast, outlet 12-7/8" x 9-5/8" on top; steel housing, gray enamel finish; four mounts w/two 21/64" diam holes in ea on 16-1/2" x 14" mtg/c; blower furnished less hood cover; Collins Rad part/dwg #506 2242 003.	Circulates air in RF cabinet.	
B1501 (alt)	BLOWER: centrifugal vane; elec motor operated; 12-1/4" diameter wheel, 58 blades; nonportable; unguarded; motor 1-1/2 hp, 60 cyc, 3 ph, 220 v;	Circulates air in r-f cabinet.	6Z879-37

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	25-3/4" lg x 26-3/4" wd x 25-7/8" h o/a; adj intake single speed 1250 rpm; belt drive; 3/8" wd pulley; clockwise bottom angular upblast; outlet 12-7/8" x 9-5/8" on top; steel housing, gray enamel finish; four mts w/two 21/64" dia holes in ea on 16-1/2" x 14" mtg/c; blower furnished less hood cover; Collins Rad part/dwg #504 1794 003.		
E1514, E1515	BOARD, terminal: general purpose binding post strip; 4 screw term; 9/16" c to c, w/barriers; molded phenolic board; 3-7/32" lg x 1-5/16" wd x 5/8" thk o/a; four .209" diam mtg holes on 2-13/16" x 1/2" mtg/c; Jones HB type 142.	E1514: B1501 terminal board. E1515: Inter-cabinet connections for B1501.	
E1575	BOARD, terminal: general purpose; two #6-32 Bind H screw term; term 7/16" c to c w/barriers molded bakelite board; 1-5/8" lg x 7/8" wd x 5/16" thk excluding barriers; four .175" diam holes spaced 1-5/16" x 27/64" mtg/c; Jones HB type 141-Y.	Connects S1507.	
O1571	BUSHING: ball brg bushing; steel; 1-5/8" lg x 1.2500" OD x .7500" ID; Thompson Industries, Inc #A-122026.	Guides L1505 and L1506 drums.	2Z1409-389
W1501	CABLE ASSEMBLY, special purpose: single #18 AWG stranded cond, 7 strands 1779 cir mil, cotton braid, color-coded, 3500 v rms test, tinned copper shielded braid 288 strands #34 AWG, 11/16" dia o/a; 25 ft. lg excl terminations; Cannonelec connector #IK-30-23C-1 one end, #RIK-3024C-1-1/8 other end; Collins Rad part/dwg #504 1862 004.	Cable from cabinet to meters and switches on upper front door of the u-f unit.	3E4002.116
Z1509	CABINET: for mtg and enclosing six Servo amplifiers; aluminum chassis; empty; 17" lg x 5-1/8" wd x 14-1/2" h approx o/a; interior includes six 10 term sockets, two term blocks, two term strip pads, two base support blocks; handle on top; inside hinged cover; Collins Rad part/dwg #505 6606 004.	Mtg chassis.	
W1503	CABLE ASSEMBLY, special purpose: 11 No. 18 AWG cond, ea w/7 strands; 1000 v max working; 10 ft. lg o/a; Collins Rad part/dwg #506 7094 005.	Cable from cabinet to lower front door.	3E4002.138
C1301, C1305	CAPACITOR, fixed: vacuum dielectric; 6 uuf, ±10%; 20,000 v; Collins Rad part/dwg #919003600.	C1301: Coupling plate J1301. C1305: Coupling plate V1303.	3D9006-39
C801, C802	CAPACITOR, fixed: paper dielectric; 1 uf 9 +20%-10%; 600 vdcw; JAN type CP61B1FF109V.	C801: K801 coil shunt. C802: K802 coil shunt.	3DB1-280
C805	CAPACITOR, fixed: paper dielectric; 500,000 uuf +40-15%; 600 vdcw; JAN type CP53B1FF504X.	Feedback phasing.	3DA500-772

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C803, C804	CAPACITOR, fixed: paper dielectric; 250,000 uuf ±10%; 600 vdcw; JAN type CP54B1FF254K.	C803: K801 spark suppressor. C804: K802 spark suppressor.	3DA250-372
C1310	CAPACITOR, fixed: ceramic dielectric; 67 uuf ±5%; 5000 vdcw; Centralab #850-022.	Part of low-pass filter.	3D9067-2
C1503, thru C1514 C1557, thru C1584	CAPACITOR, fixed: ceramic dielectric; 1000 uuf ±20%; 500 vdcw; Centralab #858 .	C1503, C1504: V1504 filament coupling. C1505, C1506: V1505 filament coupling. C1507, C1508: V1506 filament coupling. C1509, C1510: V1503 filament coupling. C1511, C1512: V1502 filament coupling. C1513, C1514: V1501 filament coupling. C1557, C1558: V1501 filament bypass. C1559, C1560: V1502 filament bypass. C1561, C1562: V1503 filament bypass. C1563, C1564: V1504 filament bypass. C1565, C1566: Bypass for spare filament wire. C1567, C1568: V1505 filament bypass. C1569, C1570: V1506 filament bypass. C1571, C1572: V1501 filament coupling. C1573, C1574: V1502 filament coupling. C1575, C1576: V1503 filament coupling. C1577, C1578: V1504 filament coupling. C1579, C1580: V1505 filament coupling. C1581: V1506 filament coupling. C1582: V1507 filament coupling. C1583: Coupling for spare filament wire. C1584: Coupling for spare filament wire.	3DA1-299

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C1515, C1516,	CAPACITOR, fixed: ceramic dielectric; 100 uuf p/m 10%; neg temp coef 750 (tol p/m 113) uuf/uf/°C; 5000 vdcw; 7/8" lg x 51/64" max diam; axial screw type term; both ends tapped w/ #6-32 NC-2 x 3/16" d for mtg; uninsulated; Centralab type 850A.	C1515: V1504, V1505 and V1506 grid bypass. C1516: V1501, V1502 and V1503 grid bypass.	
C1599.1 thru C1599.4	CAPACITOR, fixed: Navy type #481689-10; ceramic dielectric; 25 uuf p/m 10%; temp coef 0 (tol p/m 30) uuf/uf/°C; 2500 vdcw RMS at 2 mc, 1000 vdcw RMS at 16 mc; 51/64" diam x 5/8" lg case; two axial 6-32 tapped holes; Centralab type 850-001.	Part of parasitic suppressor in cathode box.	
C1594, C1595	CAPACITOR, fixed: paper dielectric; 1 uf +20-10%; 400 vdcw; JAN type CP61B1DE105V.	C1594: Arc suppression for S1524. C1595: Arc suppression for S1522 and S1523.	3DB1-460
C1550, C1551, C1590 thru C1593	CAPACITOR, fixed: paper dielectric; 4 uuf ±10%; 230 vdcw; Collins Rad #930 0146 00.	C1550: Phase splitting for B1502. C1551: Phase splitting for B1503. C1590, C1591: Phase splitting for B1505. C1592, C1593: Phase splitting for B1504.	3D34-367
C1530A thru C1532A	CAPACITOR, variable: vacuum dielectric; 25 to 500 uuf, 15,000 v peak; Jennings Rad type uxc; Collins Rad #919009200.	C1530A, C1531A: Power amplifier plate tuning. C1532A: Antenna tuning.	3D9500V-9
C1540	CAPACITOR, fixed: paper dielectric; 100,000 uuf +40-15%; 600 vdcw; JAN type CP53B1FF104X.	V1707 grid isolation.	3DA100-1051
C1534 thru C1537	CAPACITOR, fixed: mica; 22,000 uuf ±20%; 600 vdcw; JAN type #CM50B223M.	C1534: M1501 bypass. C1535: M1502 bypass. C1536: M1503 bypass. C1537: M1504 bypass.	3K5022324
C1541, C1598	CAPACITOR, fixed: paper dielectric; 2 uf ±10%; 400 vdcw; HS metal can; 2-1/4" lg x 1-3/16" wd x 1-3/16" h; impr w/mineral oil; 2 solder lug term. located on side; accom mtg bkt; Sangamo type #62A to Collins Rad spec 930 0182 00.	C1541: Filter for K1507. C1598: Filter for K1503.	3DB2-289
C1538, C1539	CAPACITOR, fixed: vacuum dielectric; 50 uuf ±2%; 30,000 v r-f peak; 6-15/16" lg x 2-7/8" dia o/a in sealed glass envelope; one 11/16" lg ferrule term. ea end; term. mtg; Jennings Rad type VCC.	Power-amplifier plate bypass.	3D423
C1525, C1526, C1587	CAPACITOR, fixed: vacuum dielectric; single sect.; 100 uuf ±5%; sealed glass envelope, 6-1/2" lg x 2-1/2" dia o/a; 2 ferrule term., 1 ea end; term. mtg; Eimac type VC.	C1525, C1526: Power-amplifier plate bypass. C1587: Antenna tuning.	3D9100-133

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
C1587	CAPACITOR, fixed: vacuum dielectric; 250 uuf ±2%; 30,000 v r-f peak; 6-3/4" lg x 2-7/8" dia o/a in sealed glass envelope; one 3/4" lg ferrule term. ea end; term. mtg; Jennings Rad type VCC.	Antenna tuning.	3D9250-130
C1585, C1586	CAPACITOR, variable: air dielectric; single sect.; 900 uuf max, 78.5 uuf min; 13-3/8" lg x 3-1/4" h x 4-5/8" wd, excluding shaft, shaft protrudes 13/16" at one end, x 1/4" dia; shaft adj; continuous rotation either direction; screw and lug term.; 3 mtg bushings or two mtg bkt optional; Hammarlund type #TC-900-K.	C1585: V1501, V1502, and V1503 cathode tuning. C1586: V1504, V1505, and V1506 cathode tuning.	3D99002
C1596, C1597	CAPACITOR, fixed: mica; dielectric; 10,000 ohms ±20%; 200 vdcw; JAN type CM45B103M.	Arc suppressor K1502.	3K4510324
P1503A P1504A	CLAMP: type AN3057-8; cable; aluminum alloy; sandblast; 7/8"-20 NEF-2 mtg thd; 1-3/16" dia x 1-1/8" lg max o/a; accom 9/16" dia cable, 2 bolts employed for clamping; Amphenol #AN3057-8.	P1503A: Used with P1503. P1504A: Used with P1504.	2Z2636-1
E1537	CLIP, fuse: for 9/16" fuse; 13/16" x 5/8" x 19/32"; 0-30 amp 250 v, Multi Elec type 2020J; Collins Rad part/dwg #265 5010 00.	Resistor and capacitor mounting clips.	2Z2712.421
E1536	CLIP, fuse: 1/16" dia fuse; 1-5/32" x 3/4" x 23/32"; 31-60 amp 250 v; Multi Elec type 2022-J; Collins Rad part/dwg #265 1001 00.	Resistor and capacitor mounting clips.	2Z2712.420
E1535	CLIP, fuse: for 1-1/8" dia; 1-9/32" x 1-5/32" x 23/32" thk; 60 amp 600 v; Multi Elec type #2026-S; Collins Rad part/dwg #265 1015 00.	Resistor and capacitor mounting clips.	2Z2712.203
E1538	CLIP, fuse: .738" lg x 7/16" h x .459" wd; Buss #4464; Collins Rad part/dwg #265 1005 00.	Capacitor clip for voltmeters.	3Z1013.5
L1501, L1502	COIL, RF: cathode choke; single wnd, single layer wnd; unshielded; 11 LH turns of copper tubing, covered w/fiber glass tubing; 6-5/8" OD x 10-1/4" lg o/a; air core; 7 ins leads 10" out of ea end of coil; Collins Rad part/dwg #504 1042 003.	L1501: V1501, V1502, and V1503 r-f filter choke. L1502: V1504, V1505, and V1506 r-f filter choke.	3C357-70
L1506	COIL, RF: plate tank; single wnd, single layer wnd; unshielded; 4-1/2 LH turns of soft copper pipe; 11" OD x 10-3/16" lg, connector extends 2-11/16" below coil; air core; brass connector w/two .437" dia mtg holes spaced 2.812" c to c on one; coil plug on other end; Collins Rad part/dwg #504 1882 004.	Power-amplifier plate coil.	3C1084S-104
L1507	COIL, RF: plate tank; single wnd, single layer wnd; unshielded; 3-3/4 RH turns of 3/4" OD soft copper tubing; 11-1/2" OD x 7" lg o/a; air core; coil fastened to mycalex bars; Collins Rad part/dwg #504 1825 003.	Antenna coil.	3C1084S-102

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
L1508	COIL, RF: plate tank; single wnd, single layer wnd; unshielded; 3-3/4 RH turns of 3/4" OD soft copper tubing; 11-1/2" OD x 7" lg o/a; air core; coil fastened to mycalex bars; Collins Rad part/dwg #504 1826 003.	Antenna coil.	3C1084S-103
L1509	COIL, RF: choke; single wnd; unshielded; 15 RH turns 3/16" dia copper tubing; 2" dia x 10-3/4" o/a; air core; term. mtg; single solder lug term. ea end; Collins Rad part/dwg #504 5228 002.	R-f choke plate power amplifier.	3C357-71
L1516	COIL, RF: choke; single wnd, single layer wnd; unshielded; .32uh; 5 turns #10 AWG bus wire; 1/2" ID x 1-25/32" lg o/a; term mtd; 2 solder lug term; Collins Rad part/dwg #506 7154 002.	Part of 50-mc parasitic suppression filter.	
L1510 AB, L1511 AB	COIL, RF: choke; two wnd, single layer wnd; unshielded; 85 RH turns #16 DSE wire ea; 7" lg less term. x 1-11/16" dia o/a; isolantite form, air core; 7" lg x 1" dia; 4 solder lug term. on side; Collins Rad part/dwg #504 5291 002.	L1510AB: Keeps r-f out of M1603. L1511AB: Keeps r-f out of M1603.	3C357-72
J1502	CONNECTOR, receptacle: Navy type #491977; 2-9/16" x 2-9/16" x 15/16"; 30 round female cont; Cannonelec #RIK-30-31SL; Collins Rad part/dwg #370 2025 00.	Connects upper door to cabinet.	2Z3082-135
J1501	CONNECTOR, receptacle: 30 round male cont; straight; 2-5/16" x 2-5/16" x 27/32" h; Cannonelec #IK-30-32S; Collins Rad part/dwg #370 2026 00.	Connects upper door to cabinet.	2Z3046.47
P1502	CONNECTOR, plug: 30 round male cont; 90° angle; 2-23/32" lg x 2-9/16" wd x 3-7/16"; Cannonelec #RIK-30-24C-1-1/8; Collins Rad part/dwg #370 2036 00.	Connects upper front door to cabinet (r-f bay).	2Z3046.46
P1501	CONNECTOR, plug: Navy type #49176; 30 round female cont; 90° angle; 3-13/32" lg x 2-29/32" wd x 2-1/2" d, Cannonelec #IK-30-23C-1; Collins Rad part/dwg #370 2023 00.	Connects upper front door to cabinet (r-f bay).	2Z3082-134
P1503, P1504	CONNECTOR, plug: 7 round female cont; 1-1/4" OD x 1-11/16" lg; Amphenol #AN 3107-16S-15; Collins Rad part/dwg #357 4006 00.	P1503: Plugs into servo drive. P1504: Plugs into antenna tuning servo drive.	2Z8677.14
P1507	CONNECTOR, plug: 9 round female cont; straight; 2-3/16" lg x 1-23/64" OD; 10 amp cont rating; cylindrical aluminum tin plated body; molded phenolic insert; 21/32" diam cable opening; cable mtd; knurled coupling ring; Cannonelec #GK-9-21C-5/8.	Connects B1504 motor assembly.	
P1508 thru P1513	CONNECTOR, plug: 20 female cont; straight type, 2-3/32" lg x 13/16" wd x 13/32" h excluding cont; 7.5 amp, 750 v AC RMS; rectangular, black phenolic body, brass silver pl cont; phenolic insert;	Connects Z1511.	

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	two 1/8" diam mtg holes spaced 1.842" c to c; Cinch #54A-14516.		
J1504	CONNECTOR, receptacle: 7 round male cont; Amphenol AN 3102-16S-1P; Collins Rad part/dwg #357 3007 00.	Connects antenna servo drive to servo amplifier Z1503.	2Z7117.11
J807, J808, J809	CONNECTOR, receptacle: Navy #491134-A; 10 female cont; Jones HB #SS-10-AB1/16; Collins Rad part/dwg #364 2100 00.	Connectors for Z1502, Z1503, Z1504, respectively.	2Z3071-3
•P801	CONNECTOR, receptacle: Navy type #49146; 10 male cont; Jones HB #P-10-AB1/16; Collins Rad part/dwg #363 2100 00.	Part of servo amplifier.	2Z3030-1
P1505	CONNECTOR, receptacle: 45 round male cont; straight; 3-3/8" lg x 1-11/16" wd x 1-9/32" thk o/a; Cannonelec type DPD-45-34P; Collins Rad part/dwg #370 2033 00.	Connect lower front door to cabinet.	2Z3046.52
J1505, P1506	CONNECTOR, receptacle: 45 round female cont; straight; 3-2/8" lg x 1-11/16" wd x 1-7/32" thk, o/a; Cannonelec #DPD-45-33S; Collins Rad part/dwg #370 2034 00.	Connect lower front door to cabinet.	2Z3082-140
J1507	CONNECTOR, receptacle: 9 round male pol cont; straight; 1" diam x 21/32" lg less cont; 10 amp cont rating; cylindrical aluminum tin plated body; molded phenolic insert; sq mtg fl w/four .169" diam mtg holes spaced on 1.193" x 1.193" mtg/c; Cannonelec type K, catalog #GK-9-32-SL.	Connects B1504.	
O1564	CONTACT COIL: cont plug spring flex; U shape; 1" lg x .42" wd x .812" d; Collins Rad part/dwg #504 1483 001.	Provides contact to L1505 thru L1508.	2Z3191-330
XV-1501L, XV-1502L, XV-1503L	CONTACT, case: spring; beryllium copper, silver pl; angular; .005" thk x 1/2" lg x 1/4" wd, 1/4" h o/a; single .096" dia mtg hole; Collins Rad part/dwg #505 4438 002.	Filament contacts.	2Z3193-215
XV-1501M, XV-1502M, XV-1503M	CONTACT, case: beryllium copper, silver pl; angular; .014" thk x 13/32" lg x 1/4" wd x 1/4" h o/a; single .096" dia mtg hole; Collins Rad part/dwg #505 4439 002.	Back-up spring for XV-1501L, XV1502L, and XV1503L.	2Z3194-121
E1562, O1562	CONTACT, coil: cont plug spring; beryllium copper, hard chrome pl; C shape; .018" thk x .500" wd, bent at .406" ID; Collins Rad part/dwg #504 8572 002.	E1562: Provides contact to antenna and plate tank coil. O1562: Spring provides contact to antenna and plate coils.	2Z3193-216

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
O1525	CONTACT, coil: sliding; c/o four springs riveted to inside of tubing; silver pl beryllium copper springs, brass tubing; cylindrical; 1-27/32" lg x .875" dia o/a; Collins Rad part/dwg #504 1750 002.	Antenna coupling output contact.	2Z3191-320
O1526	CONTACT, coil: shorting, flex; beryllium copper, chromium pl; 2-7/32" lg x 1/2" wd x .003" thk, bent at 45° angle; Collins Rad part/dwg #504 3613 002.	Drum shorting contact fingers.	2Z3193-213
O1527	CONTACT, coil: flat spring type; u/w plate tank coils; silver pl beryllium copper spring, Fastell UM cont; 27/32" lg x 1/2" wd x 3/8" h o/a; C shape w/.421" lg x 1/8" wd x 1/16" thk cont on bottom; Collins Rad part/dwg #504 6571 002.	Provides contact to antenna and plate tank coils.	2Z3191-313
O1528	CONTACT, coil: cont plug spring, flexible; silver pl beryllium copper spring and Fastell UM contact; U shape; 1-1/16" lg x .421" wd x .812" d o/a; Collins Rad part/dwg #504 6572 002.	Provides contact to antenna and plate tank coils.	
O1529A	CONTACT, coil: sliding type rigid; silver pl brass cont plug w/Tantung G insert; 1-3/16" lg x .615" wd x 7/8" h o/a; Collins Rad part/dwg #504 5631 002.	Part of guide block O1529.	2Z3191-315
O1529B	CONTACT, coil: flat spring type; silver pl beryllium copper; 1-7/32" lg x .437" wd x .125" h o/a; two .140" dia mtg holes .250" c to c; Collins Rad part/dwg #504 3621 002.	Part of guide block O1529.	2Z3191-319
O1529D	CONTACT, coil: ant. coil cont; brass, Berylco 25, silver pl; arm 1/2" lg plus .687" bent at 120°, 5/16" wd, cam 1.702" lg x .051" thk; Collins Rad part/dwg #504 4828 003.	Part of guide block O1529.	2Z3191-318
O1529E	CONTACT, coil: tank coil cont; brass handle, Berylco 25, cam, beryllium copper wire; bar 7/8" lg x 5/16" wd x 1/8" thk, plate semicir, rad .687", .051" thk attached to bar at 62°, rod thru plate; Collins Rad part/dwg #504 4874 002.	Part of guide block O1529.	2Z3191-316
O1530	CONTACT, coil: Faraday cont spring; beryllium copper, chromium pl; irregular shape; .020" thk x 1" wd x 1-7/16" h o/a; 2 oval mtg slots 3/8" x 3/16", .500" c to c; Collins Rad part/dwg #504 4819 002.	Ground contact for antenna coil.	2Z3191-335
O1561	CONTACT, coil: cont plug spring, flex; beryllium copper, chromium pl; C shape; .018" thk x .500" wd x .812" lg x 1/2" h o/a; approx Collins Rad part/dwg #504 3[illegible]20 002.	Provides contact to antenna and plate tank coils.	2Z3191-214

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
XV-1501D, XV-1502D, XV-1503D, XV-1504D, XV-1505D, XV-1506D	CONTACT, electron tube: u/w 3X2500A3 tube; four cont mtd on strip; beryllium copper spring, brass strip, silver pl cont; 2-1/2" lg x 9/16" wd x 1/2" thk approx o/a bent at 60° on 2-7/32" rad; two .171" dia mtg holes spaced 40° c to c; Collins Rad part/dwg #504 1521 001.	XV1501D, XV1502D, XV-1503D: Parts of tube sockets XV1501, XV-1502, and XV1503. XV1504D, XV1505D, XV-1506D: Parts of tube sockets XV1504, XV-1505, and XV1506.	2Z3191-298
XV-1501E, XV-1502E, XV-1503E, XV-1504E, XV-1505E, XV-1506E	CONTACT, electron tube: u/w 3X2500A3 tube, flex; 5 spring cont, fingers .147" wd; beryllium copper spring, silver pl cont; rectangular, bent on bottom 52° on 7/32" rad; 1-3/8" lg x 1-1/16" wd x 3/8" thk approx o/a; two .203" dia mtg holes spaced .875" c to c; Collins Rad part/dwg #504 1522 001.	XV1501E, XV1502E, XV-1503E: Parts of tube sockets XV1501, XV-1502 and XV1503. XV1504E, XV1505E, XV-1506E: Parts of tube sockets XV1504, XV-1505, and XV1506.	2Z3191-300
XV-1501F, XV-1502F, XV-1503F, XV-1504F, XV-1505F, XV-1506F	CONTACT, electron tube: u/w 3X2500A3 tube, flex; 3 cont mtd on strip; beryllium copper spring, brass strip, silver pl cont; rectangular, bent on bottom 60° on 1/4" rad; 13/16" lg x 3/8" wd x 1/2" thk approx o/a; two .140" dia mtg holes spaced 5/16" c to c; Collins Rad part/dwg #504 1523 001.	XV1501F, XV1502F, XV-1503F: Parts of tube sockets XV1501, XV-1502, and XV1503. XV1504F, XV1505F, XV-1506F: Parts of tube sockets XV1504, XV-1505, and XV1506.	2Z3191-299
XV-1501G, XV-1502G, XV-1503G, XV-1504G, XV-1505G, XV-1506G, XV-1504L, XV-1505L, XV-1506L	CONTACT, tube socket: u/w 3X2500A3 tube, flex; beryllium copper, silver pl; rectangular, bent on bottom; 15/32" lg x 1/4" wd x 3/16" inside o/a; single .098" dia mtg hole centered .093" from top; Collins Rad part/dwg #504 1602 001.	XV1501G, XV1502G, XV-1503G: Parts of tube sockets XV1501, XV-1502, and XV1503. XV1504G, XV1505G, XV-1506G: Parts of tube sockets XV1504, XV-1505 and XV1506. XV1504L, XV1505L, XV-1506L: Parts of tube sockets XV1504, XV-1505, and XV1506.	2Z3191-301

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
XV-1501K, XV-1502K, XV-1503K, XV-1504K, XV-1505K, XV-1506K	CONTACT, tube socket: silver pl hard copper; cylindrical; 2-27/32" lg x 7/8" OD, .609" ID; thd 3/4-28 NS-2 x 7/8" for mtg; Collins Rad part/dwg #504 5617 002.	XV1501K, XV1502K, XV-1503K: Parts of tube sockets XV1501, XV-1502, and XV1503. XV1504K, XV1505K, XV-1506K: Parts of tube sockets XV1504, XV-1505 and XV1506.	2Z3191-297
O1585C	COUPLING, rigid: split sleeve; .250" shaft opening ea end; clamp mtd; 1" lg x .436" wd o/a; SS type #303; Collins Rad part/dwg #504 7525 002.	Split hub.	
O1548	DIAL: knob type; molded black phenolic; 100 scale div marked 0 to 90; units of 10, 360°; Collins Rad part/dwg #503 8082 002.	Servo control knobs.	2Z3723-260
E1577	DIAL: movable scale type control dial; aluminum black anodized; round; 1-5/32" OD x 3/4" d; accom 1/8" diam shaft, 1/4" diam bushing, 1/4-32 NEF-2 thds; w/ markings; dial indicate proportion of total multiturn coil length traversed by sliding contact; Helipot Corp type SR-100.	Tuning control.	
O 1565 O 1567	DRUM BRAKE: round; SS type #303; 1.005" OD x .161 ID x 1/2" d; Collins Rad part/dwg #505 7511 002.	O 1565: Stops B1503. O 1567: Stops B1502.	2Z3880-12
F1501	FUSE, cartridge: .5 amp 250 v; 1-1/4" lg x 1/4" dia o/a; Littelfuse #313.500; Collins Rad part/dwg #264 4260 00.	T1503 primary fuse.	3Z2595.7
F1502	FUSE, cartridge: 1 amp, blow time 0-1 hr at 135% load, 60 sec max 5 sec min at 200% load, rated continuous at 110% load; Littelfuse #313001, type #3AG.	Fuse for T1505.	
O 1512	GEAR: spur; linen base natural phenolic; straight teeth; 90 teeth; 24 pitch, 3.750 PD; 3-1/16" dia x 3/8" thk o/a; straight face; 1-3/8" OD x 1-1/4" thk hub; 5/16" dia shaft mtg hole in ctr of hub; Collins Rad part/dwg #504 4667 002.	Part of antenna tuning drive assembly.	2Z4878-1201
O 1522 O 1523	GEAR: bevel; 36 teeth; 1.559" dia x 21/32" d o/a; Collins Rad part/dwg #503 9123 002.	Parts of antenna tuning drive assembly.	2Z4878-1183
O 1532	GEAR: spur; SS; 14 teeth; 1/2" OD x .188" ID x 9/16" thk o/a; Collins Rad part/dwg #504 1566 001.	Part of plate tuning drive assembly.	2Z4878-1185
O 1547	GEAR: spur; 60 teeth; 1.2915" OD x .250" ID x .494" thk o/a; Collins Rad part/dwg #503 9082 002.	Drives servo dial.	2Z4878A-150

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
O 1572	GEAR: spur type; SS type #303; American standard involute tooth form; 36 teeth; 48 pitch, .750" PD; .800" OD x .125" thk face wd; straight face; .250" diam hub extends .140" beyond face on one side .647" beyond face on other side; shaft mtg; Collins Rad part/dwg #506 7662 002.	Operates S1523	
O 1574	GEAR: spur type; SS type #303; output; American standard involute tooth form; 72 teeth; 48 pitch, 1.500" PD; 1.550" OD x 1/8" thk face wd; straight face; .301" diam hub extends 7/16" beyond face on one side 1-3/8" beyond face on other side; shaft mtg; Collins Rad part/dwg #506 7659 002.	Output for B1504 gear assy.	
O 1576	GEAR: spur type; SS type #303; output; American standard involute tooth form; 72 teeth; 48 pitch, 1.500" PD; 1.550" OD x 1/8" thk face wd; straight face; .301" diam hub extends 1/2" beyond face on one side 7/8" beyond face on other side; shaft mtg; Collins Rad part/dwg #506 7667 002.	Output for B1505 gear assy.	
O 1513, O 1514	GEAR: spur; linen base natural phenolic; straight teeth; 90 teeth; 24 pitch, 3.750" PD; 3-7/8" dia x 3/8" thk o/a; straight face; 21/32" dia x 7/8" thk hub; 9/32" dia shaft mtg hole in ctr of hub; Collins Rad part/dwg #504 4668 002.	Parts of antenna tuning drive assembly.	2Z4878-1202
O 1535	GEAR: spur; linen base phenolic; straight teeth; 48 teeth; 24 pitch, 2.000" PD; 2-3/32" dia x 5/16" thk o/a; straight face; 25/32" dia x 1-3/8" lg hub; 15/32" dia shaft mtg hole in ctr of hub; Collins Rad part/dwg #504 1699 002.	Part of plate tuning drive assembly.	2Z4878-1203
O 1537	GEAR: spur; linen base phenolic; straight teeth; 120 teeth; 24 pitch, 5.000" PD; 5-1/8" dia x 5/16" thk o/a; straight face; 27/32" dia x 23/32" thk hub; .593" dia shaft hole; Collins Rad part/dwg #504 1798 003.	Part of plate tuning assembly.	2Z4878-1212
O 1573, O 1575	GEAR ASSEMBLY: intermediate type; c/o one output gear and one pinion on shaft; pinion w/ 24 teeth, gear w/ 72 teeth; SS type #303; pinion 48 pitch, PD .500", gear 48 pitch, 1.500" PD; round; 1.550" OD x .811" lg; shaft mtg; American standard involute tooth form; Collins Rad part/dwg #506 7656 002.	Idler on B1504 gear assy.	
XF1501 XF1502	HOLDER, fuse: extractor post type; for single 3 AG cartridge fuse; 2-5/16" lg x 13/16" dia o/a; Buss type HKP; Collins Rad part/dwg #265 1002 00.	XF1501: Used to mount F1501. XF1502: Mounts F1502.	3Z3282-42.9

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
O-1585A	HUB: mts main drive shaft; SS type #303, passivated; round; 1" diam one end, .437" diam on other end, .250" ID x .249" thk o/a; pinned to end of shaft; .062" h x .155" wd raised portion across face of hub; Collins Rad part/dwg #505 0728 002.	Plain hub.	
E1534, E1551	INSULATOR, stand-off: cylindrical pillar; grade L-5-ceramic; 5/8" lg x 1/4" dia; #4-40 NC-2 X 3/16" dia end; Centralab 2X783; Collins Rad part/dwg #190 1105 00.	E1534: Tie point for servo controls. E1551: Tie point for K-1501.	3G350-128
E1543	INSULATOR, standoff: cylindrical; white grade L-4B steatite; 2" lg o/a; 1" OD, two tapped 1/4"-20 x 5/8" d mtg holes, 1 ea end; JAN type NS4W0416.	Mounts L1509.	
E1523	INSULATOR, bowl: cup shape; JAN type NS4W4601.	H-V feedthru.	3G3546-01.2
E1518, E1519	INSULATOR, stand-off: round post shape; JAN type NS4W0316.	E1518: Part of S1513, S1514, and S1515. E1519: Supports C1585 and C1586.	3G3503-16.3
E1530	INSULATOR, STAND-OFF: round post shape; JAN type NS4W0308.		3G3503-08.1
E1513, E1531	INSULATOR, stand-off: grade L-4 ceramic white glazed; 1" dia tapped 1/4-20" x 5/8" d at ea end; Collins Rad part/dwg #190 1173 00.	E1513: Inter-cabinet grid. E1531: Mounting insulator.	3G350-201
E1524	INSULATOR, bowl: glazed isolantite; 2-3/4" h; Generaco #1088-00; Collins Rad part/dwg #190 6930 00.	Transmission line feedthru.	3G1350-33
E808 thru E811	INSULATOR, feedthru: round; Rohden type #502; Collins Rad part/dwg #190 1103 00.	Feedthru to 801.	3G290-42
E1545	INSULATOR, stand-off: JAN type NS4W0106.	Mounts L1510 and L1511.	3G3501-06.1
E1525	INSULATOR, stand-off: cylindrical pillar; grade L-4 ceramic, white glaze on heavy lined surfaces; 3" lg; 1-3/4" dia o/a, tap #10-32 NF-2, 8 holes (4 ea end) on 1-1/4" dia ctr, staggered; isolantite: JAN type #NS4W0624.	Used to mount support bracket for C1530 and C1531.	
E1526	INSULATOR, stand-off: cylindrical; grade L-4 ceramic, white glaze on heavy lined surfaces: 4" lg; 1-3/4" dia o/a, tap #10-32 NF-2, 8 holes (4 ea end) staggered; isolantite; Collins Rad part/dwg #190 1169 00.	Mounting insulator for C1532.	3G3506-32.1
E1527	INSULATOR, stand-off: round post shape; JAN type #NS4W0332.	Mounting insulator for antenna coupling shorting bar.	3G3503-32.3

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
E1528	INSULATOR, stand-off: round post shape; JAN type #NS4W0320.	Mounting for shorting contact of left and right drum assembly.	3G3503-20
E1529	INSULATOR, stand-off: round post shape; grade L-4 ceramic, white glaze on heavy lined surfaces; 5" lg; 1-1/4" dia o/a, tapped 1/4"-20 x 5/8" d at ea end; Collins Rad part/dwg #190 1191 00.	Mounting insulator for cathode choke assembly.	3G3505-40.1
E1532 XV-1501I thru XV-1506I	INSULATOR, stand-off: round post shape; grade L-4 ceramic, white glaze on heavy lined surfaces; 4" lg; 1-1/4" dia o/a, tapped 1/4"-20 x 5/8" d at ea end; JAN type NS4W0532.	E1532: Supports anode ring. XV1501I, XV1502I, XV-1503I: Parts of tube sockets XV1501, XV-1502, and XV1503. XV1504I, XV1505I, XV-1506I: Parts of tube sockets XV1504, XV-1505, and XV1506.	3G350-131
E1533	INSULATOR, standoff: cylindrical; white, grade L-4B steatite; 4.000" lg o/a; 1-3/4" OD, 8 tapped #10-32 x 3/8" d mtg holes, 4 ea end; JAN type NS4W0632.	Supports power amplifier tube mounting plate.	
E1546	INSULATOR, stand-off: cylindrical pillar; grade L-4 ceramic, white glaze on heavy lined surfaces; 2-1/2" lg; 1" dia, tapped 1/4"-20 x 5/8" d at ea end; JAN type NS4W0420.	Used to mount mycalex plate used with L1510 and L1511.	3G3504-20.1
E1576	INSULATOR, stand-off: round post shape; grade L-4 ceramic, white glaze on heavy lined surfaces; 1" lg; 1/2" diam o/a; tapped 8-32 x 3/8" d at ea end; JAN type #NS4W0208.	Mounts Parasitic suppressor in cathode box.	
E1541, E1542	KNOB: round; black phenolic; for 1/4" dia shaft; 1-3/4" dia x 7/8" d; Collins Rad part/dwg #503 2377 002.	E1541: Left p-a dial. E1542: Right p-a dial.	2Z5824.131
I513.1 thru I513.10	LAMP, glow: 1/25 w, 105-125 v; 1-1/8" lg o/a; GE #NE-51; Collins Rad part/dwg #262 0021 00.	Channel indicators.	2Z5888-5
I1501 thru I1508	LAMP, incandescent: 120 v, 6 w; double cont, bayonet candelabra base; GE; Collins Rad part/dwg #262 0041 00.	I1501: M1501 lamp. I1502: M1502 lamp. I1503: M1503 lamp. I1504: M1504 lamp. I1505 thru I1507: Pilot lamp in r-f unit. I1508: Indicator in r-f unit.	6Z6810-6
I1510.1 thru I1510..10	LAMP, incandescent: 6.3 v, 0.15 amp; bulb T-3-1/4, clear; 1-1/8" lg o/a; miniature bayonet base; tungsten filament; burn any position; GE type #47.	I1510.1-.10: Channel indicator.	2Z5952

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
I1511.1 thru .10 thru I1515.1 thru .10	LAMP, incandescent: .6 v, .200 amp; bulb T-1-3/4, clear; 5/8" max o/a lg; midget fl base; tungsten filament; burn any position; GE Mazda #328.	Channel illumination.	
I1509, I1518	LAMP, glow: 110 v to 120 v a-c or d-c, 1/10 w; rectangular translucent white; 1-3/8" lg; Littelfuse #200 001.	I1509: F1501 failure indicator. I1518: Blown fuse indicator for F1502.	2Z5889-27
XI1501 thru XI1504	LAMP HOLDER: double cont candelabra bayonet base; 1-9/16" lg x 1" wd x 1-1/8" h; Dialco #9-S-4634-L-46; Collins Rad part/dwg #262 0042 00.		2Z5988-39
XI-1510.1 thru .10	LIGHT, indicator: w/o lens; Drake #225A; Collins Rad part/dwg #262 1260 00.	Mounts I1510A.	2Z5991-221
XI-1507A	LENS, indicator light: red; thd type; 1-9/16" OD x 35/64" thk; Collins Rad part/dwg #262 0104 00.	Part of indicator light XI1507.	2Z6125-264
XI-1506A	LENS, indicator light: green; thd type; 1-9/64" OD x 35/64" lg; Collins Rad part/dwg #262 0105 00.	Part of indicator light XI1506.	2Z6125-263
XI-1505A, XI-1508A	LENS, indicator light: amber; thd type; 1-9/64" OD x 35/64" lg; Collins Rad part/dwg #262 0106 00.	XI1505A: Part of indicator light XI1505. XI1508A: Part of indicator light XI1508.	2A6125-262
XI-1510.1A thru .10A	LENS, indicator light: red; Drake mfg #25; Collins Rad part/dwg #262 2160 00.	For I1510A thru I1510J.	2Z6125-279
XI1505 thru XI1508	LIGHT, indicator: w/o lens; for double cont candelabra; bayonet base bulb; 2-5/8" lg x 1-3/8" OD; Dialco type #51702-67.	XI1505: Mounts I1505. XI1506: Mounts I1506. XI1507: Mounts I1507. XI1508: Mounts I1508.	2Z5991-377
O1551A	MAINTENANCE PART KIT: for link belt silent chain S-1807; Collins Rad part/dwg #233 0033 00.	For link belt silent chain.	2Z5727-142
O1510A O1544A	MAINTENANCE PART KIT: for link belt duplex chain D-1810; Collins Rad part/dwg #233 0038 00.	For link belt duplex chain.	2Z5727-145
M1501	AMMETER: d-c; range 0-20 d-c amp; rectangular flush mtd black phenolic case; 3.70" x 3.950" body, 1.6250" d behind fl, 4" x 4.250" x 3/16" fl; 1% accuracy; calibrated for 3/32" thk steel panel; 40 scale divisions, black markings on white background, window in top of case for illumination; incl ext shunt R1501 and 16 ft. leads; two mtg lugs fastened on bottom of case, two 8-32 NC-2 x 1-1/4" screws; two screw type term. 1/4"-28 NF-2, 3/4" lg; Weston type #741.	TOTAL PLATE CURRENT meter for power amplifier.	3F902-21

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
M1503	AMMETER: d-c; range 3 d-c amp; rectangular flush mtd black phenolic case; 3.70" x 3.950" body, 1.625" d behind fl, 4" x 4.250" x 3/16" fl; 1% accuracy; calibrated for 3/32" thk steel panel; 60 scale divisions, black markings on white background, window in top of case for illumination; self-contained; two mtg lugs fastened on bottom of case, two #8-32 NC-2 x 1-1/4" screws; two screw type term. 1/4"-28 NF-2 x 3/4" lg; Weston model 741.	TOTAL GRID CURRENT meter.	3F1003-31
M1505, M1506	AMMETER: thermo r-f; range 15 r-f amp; rectangular, black phenolic flush mtg case; 3.70" x 3.950" body, 1.630" d behind fl, 4" x 4.250" x 3/16" fl; calibrated for nonmagnetic panels; 75 scale divisions, black markings on white background, window in top of case for illumination; self-contained; two mtg lugs fastened on bottom of case, two 8-32 NC-2 x 1-1/4" screws; two screw type term. 1/4"-28 NF-2, 3/4" lg; Weston model 743.	ANTENNA current meters.	3F1015-52
M1502	METER, arbitrary scale: scale marking 0-500, no specific unit of measure; rectangular black flush mtd phenolic case; 3.7" x 3.950" body, 1.630" d behind fl, 4" x 4.250" x 3/16" lg; ±1% accuracy; calibrated for 3/32" steel panel; 50 scale divisions, black markings on white background, window in top of case for illumination; ext shunt required; two mtg lugs fastened on bottom of case, two 8-32 NC-2 x 1-1/4" lg; two screw type term. 1/4"-28 NF-2, 3/4" lg; Weston type #741.	DC TEST meter indicates d-c cathode current in each of the power-amplifier stages.	3F950-66
M1504	METER, arbitrary scale: d-c; scale marking 0-100, no specific unit of measure; rectangular black flush mtd phenolic case; 3.7" x 3.950" body, 1.630" d behind fl, 4" x 4.250" x 3/16" fl; ±1% accuracy; calibrated for 3/32" steel panel; 50 scale divisions, black markings on white background, window in top of case for illumination; ext shunt required; two mtg lugs fastened on bottom of case, two 8-32 NC-2 x 1-1/4" screws; two screw type term. 1/4"-28 NF-2, 3/4" lg; Weston type #741.	RF TEST meter used with Z1505, Z1506, Z1507, and Z1508.	3F910-66
Z1505, Z1506	METER, voltmeter: (less meter) LV vacuum; 1 fixed mica capacitor, 1 vacuum capacitor, 2 fixed resistors and 1 tube socket on grid meter chassis; metal chassis; 6 uuf and .0047 uf capacitors, 10,000 ohm 1 w and 270,000 ohm 2 w resistors; rectangular; 9" lg x 4-1/4" wd x 3-1/2" h o/a; Collins Rad part/dwg #504 2302 004.	Cathode voltmeter.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
Z1507, Z1508	METER, voltmeter: (less meter) HV vacuum; 1 fixed mica capacitor, 1 fixed ceramic capacitor, 1 variable and 1 vacuum capacitor, 2 fixed resistors and 1 tube socket on chassis; metal chassis; 4700 uuf, 51 uuf, 6 uuf and 100 uuf capacitors, 10,000 ohm 1 w, 390,000 ohm 2 w resistors; rectangular; 9-1/4" lg x 3-3/8" wd x 7-1/2" h o/a; Collins Rad part/dwg #504 2305 004.	Plate voltmeter.	
B1501B	MOTOR, AC: induction type; 1.5 hp, 1450/1750 rpm; closed frame; 40°C max temp rise; pulley not included, 3/16" x 3/32" keyway; 12-1/2" lg x 10-1/8" diam, 2-1/4" lg shaft; 208/220 v AC, 3 phase, 50 to 60 cps, 4.8 amp; fixed mtg base; four 13/32" diam mtg holes spaced 8" x 6-1/2" mtg/c; wool packed sleeve bearings; Peerless Elec #PA 204.	Replacement motor for B1501.	
B1501B (Alt)	MOTOR, AC: induction type; 1-1/2 hp, 1730 rpm on 60 cps, 1440 rpm on 50 cps; totally enclosed; temp rise open 40°C, closed 55°C; pulley not included; 12-3/4" lg x 11-29/32" wd x 9-27/32" h o/a; shaft 3/4" diam protruding 2-3/8" from frame; 220/440 v AC, 50/60 cps, 3 phase, 4.43/2.22 amp per phase on 60 cps, 5.90/2.95 amp per phase on 50 cps; fixed mtg base; four 13/32" diam mtg holes on 8" x 6-1/2" mtg/c; ball bearings; replacement motor for blower, Collins Rad part/dwg #009 1107 00; GE #5K204D24.	Part of blower B1501.	
B1502, B1503	MOTOR, AC: low inertia, servo motor, squirrel cage induction; 12 oz inch torque, 2400 rpm, 0.0029 hp; 115/115 2 ph, 60 cps; 4" lg x 2-5/8" wd x 3-3/16" h o/a; Diehl type #FPE 49-7; Collins Rad part/dwg #230 0122 00.	B1502: Servo motor for power-amplifier plate tuning. B1503: Servo motor for antenna tuning.	3H3000-178
B701(B)	MOTOR, AC: squirrel cage induction type; 12 oz inch torque, 1400 to 2900 rpm, 10 w; 115/115 uv, 2 ph, 60 cyc, .16 amp per ph; 4" lg x 2-5/8" wd x 3-3/16" h excluding shaft; Collins Rad part/dwg #504 1074 002; ea.	Servo drive motor for Z1510.	3H3000A06-16
B1504, B1505	MOTOR, AC: squirrel-cage type; 1900 rpm min; closed frame, 2 pole; 2-11/16" lg x 1-3/4" dia, .1870" dia shaft protrudes 21/32" from side of frame; 102.0 to 126.5 v a-c, 50/60 cps, single ph; face mtg; three #6-32 NC-2 x 1/4" d tapped mtg holes equally spaced on .640" rad; brg lubricated for life of motor; Collins Rad part/dwg #502 6809 002.	B1504: Operates C1585 and C1586. B1505: Operates S1520.	
Z1501	POWER SUPPLY: servo, c/o one pilot light, 1 terminal, 1 connector, 2 transformers, 1 resistor, 1 capacitor, 1 chassis; metal chassis; rectangular; 19" lg x 5" wd x 9-1/3" h; mtd by four slots, two on ea end of flange; Collins Rad part / dwg #505 7608 004 (incl I-901, J-901, T-902, T-901, R-901, E-901, C-901).	Servo amplifier power.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
I901	LAMP, glow: 110 to 120 v a-c or d-c, 1/10 w; mtg base 1-7/8" lg x 9/16" wd x 7/32" thk; Littelfuse type #201 001.	Power on.	
J901	CONNECTOR, receptacle: 12 rectangular male pol cont; straight; 2-3/4" lg x 1" wd x 1/2" thk, less lugs, cont and mtg bkt; black finish; bakelite insert; two mtg bkt w/.147" diam holes on 3-3/8" ctr; Jones HB #P-412-AB1/16.	Connects power supply to servo amplifier cable.	
T902	TRANSFORMER, power: fil type; input 230 v, tapped for 208 v oper, 50/60 cps, single ph; 1 output wnd; sec 130 v tapped for 50, 65, 80, 100, 115 v oper at 1.0 amp; 2500 v test; vacuum impr, compound filled; encl drawn steel case; 4.110" lg x 4.600" wd x 5-5/16" h excl term and mtg flange; 10 screw type term on bottom; six .230" diam mtg holes in 2 rows 4-3/4" apart, 3 on ea side spaced 1-1/4" c to c; drawing; Chi Trans #12875.	Tuning motor power.	
T901	TRANSFORMER, power: fil type; input 245 v DC, 50/60 cps; 3 output wnd; secd #1, 350 v at 125 ma for 58 min rising to 250 ma for remaining 2 min, sec #2, 100 v at .400 amp, sec #3, 6.3 v at 6.0 amp; pri 2500 v RMS, sec #1, 2, 3, 2500 v test; drawn steel case; 5-9/32" lg x 4-19/32" wd x 5-5/16" h including mtg flange; ten #8-32 NC-2 stud term located on bottom; six 0.230" diam mtg holes spaced on 1.25" x 1.25" x 4.75" mtg/c in fl; minus 20°C to 50°C ambient temp; Chi Trans type #17169.	Servo amplifier power.	
R901	RESISTOR, fixed: comp; .18 megohm p/m 10%; 1 w; characteristic ltr F; .750" lg x .280" diam; ins, humidity and RSW; 2 axial wire lead term; JAN type RC30BF184K.	I901 series.	3RC30BF184K
E901	TERMINAL, stud: molded melamine body, terminal brass tin dipped, insert brass cad pl; round post shape; 23/32" lg o/a, 17/32" lg less term, 1/4" diam; #4-40 NC-2 tapped 3/16" d one end, slotted solder lug other end; Whitso, Inc. #103-A-1.	Tie points for R901.	
C901	CAPACITOR, fixed: paper dielectric; .5 uf plus 40% minus 15%; 600 vdcw; HS metal case, nonmagnetic, uninsulated; 1-13/16" lg x 1" wd x 7/8" d excluding term and mtg; Dykanol impr; 3 solder lug term located on side spaced 17/32" c to c; no internal gnd cont; 2 mtg feet w/3/16" diam holes in ea on 2-1/8" c to c; JAN type CP53B1FF504X.	Transient filter.	

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
XV-1501B XV-1502B XV-1503B XV-1504B XV-1505B XV-1506B	PULLER, tube: extracts tube; brass; 3-1/8" lg x 3/4" wd x 23/32" h approx o/a; two mtg holes on bottom tapped 4-40 NC-2, spaced .312" c to c; Collins Rad part/dwg #504 1680 002.	XV1501B, XV1502B, XV1503B: Parts of tube sockets XV1501, XV-1502, and XV1503. XV1504B, XV1505B, XV1506B: Parts of tube sockets XV1504, XV-1505, and XV1506.	2Z1244-103
CR801 CR802	RECTIFIER, metallic: selenium; series connected; input 130 v a-c, 60 cyc single ph; output 125 v d-c, 100 ma, half-wave; rectangular 1-1/4" wd x 1-5/32" h x 11/16" d excluding term.; Fed tele & Rad #403D2625; Collins Rad part/dwg #353 0006 00.	Input limiter.	3H4956-76
CR1501	RECTIFIER metallic: selenium; nom input 140 v a-c, single ph, 60 cyc; nom output 108 v d-c, 600 ma at 45° C; 5-27/32" lg x 1-3/4" wd x 2-1/2" h o/a; Fansteel Metallur #BDO74T; Collins Rad part/dwg #353 0125 00.	115 v d-c supply.	3H4860-304
CR1502	RECTIFIER, metallic: selenium; input 130 v a-c, single ph; output 380 v d-c inverse, half-wave; 1-17/32" lg x 1-17/32" wd x 1" d; Fed tele & Rad #1006A; Collins Rad part/dwg #343 0019 00.	115-volt d-c supply.	3H4860-223
K801, K802	RELAY, armature: cont arrangement; SPDT, double break; cont rating 8 amp, 24 v d-c; single wnd; oper cur 9-11 ma, release cur 2.4 ma, 9000 ohms ±10%; 2-1/16" lg x 1-5/8" wd x 1-1/2" h; Collins Rad part/dwg #408 1018 00.	K801: Servo motor control. K802: Motor control.	2Z7599-109
K501	RELAY, armature: cont arrangement left 1C, right 1B; cont rating 1C, 1 amp at 150 v d-c inductive 1B, 1 amp at 230 v d-c resistive; Collins Rad part/dwg #970 1716 00.	Controls tuning voltages.	2Z7599A-530
K1508	RELAY, armature: cont arrangement left 1A; cont rating 1 amp at 150 v d-c inductive; Clare CP type E; Collins Rad part/dwg #970 1711 00.		2Z7599A-531
K1503, K1507	RELAY, armature: cont arrangement left 1A, right 1A, 1B; cont rating 1 amp at 150 v d-c inductive; Clare CP type E; Collins Rad part/dwg #970 1726 00.		2Z7599A-532
K1505	RELAY, armature: cont arrangement left 1A, right 1C; cont rating 1A, 1 amp at 150 v d-c inductive, 1C, 1 amp at 220 v d-c resistive; Collins Rad part/dwg #970 1712 00.		2Z7599A-533
K1504	RELAY, armature: cont arrangement left 2A, right 2C; cont rating 1 amp at 150 v d-c inductive; Collins Rad part/dwg #970 1717 00.		2Z7599A-534

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
K1502	RELAY, armature: cont arrangement 2C; cont rating 10 amp at 115 v d-c; Collins Rad part/dwg #972 1296 00.		
R1563, R1564	RESISTOR, fixed: comp; 18 ohms ±10%; 2 w; JAN type #RC42BF180K.	Prepositioning voltage-dropping resistors.	3RC42BF180K
R1517, R1518	RESISTOR, fixed: comp; 2200 ohms ±5%; 2 w; JAN type RC42BF222J.	R-f grid voltmeter series.	3RC42BF222J
R1509, R1510	RESISTOR, fixed: WW; .80 ohm ±1%; 12 w at 275° C max continuous oper temp; 2" lg x 19/32" max dia; vitreous coating, RSW; 2 rad tab term. 7/8" lg x 11 to 17/64" wd x .016" thk min; axial mtg hole to clear #6 screw; WL type #M-32.	Power-amplifier meter shunt resistors.	3Z5988-8
R1508	RESISTOR, fixed: WW; 900 ohms ±1%; 1/2w; MIL type RB17K900ROF.	D-c multiplier.	3RB4-9000.3
R-1571.1 thru R-1571.10	RESISTOR, variable: 10,000 ohms ±5%; 2 w; Collins Rad #377023000.	Z1502 servo panel resistor.	3Z7410-241
R1562	RESISTOR, fixed: comp; 470,000 ohm p/m 10%; 1 w; characteristic ltr R; .750" lg x .280" diam; ins, humidity and RSW; 2 axial wire lead term; JAN type RC30BF474K.	Bias for V1507.	3RC30BF474K
R1579	RESISTOR, fixed: carborundum; 10 ohm p/m 20%; 22 w; 5" lg x 5/8" diam; uninsulated; pure resistance load, ea end sprayed w/brass for 5/8"; Carborundum type CX.	PA grid series.	
R-1581.1 thru .10	RESISTOR, fixed: WW; 1.25 ohm p/m 3%; 2 w at 275°C max continuous oper temp; 1/4" diam x 3/4" lg max; silicone coated; RSW; two axial wire lead term, 1-1/4" lg ea end; power type resistor characteristic ltr F; Dale Products type RS-2.	Illumination light series.	
R801,	RESISTOR, fixed: comp; 4700 ohms ±10%; JAN type RC30BF472K.	R801: Servo amplifier.	3RC30BF472K
R809, R810	RESISTOR, fixed: comp; 2.2 meg ±10%; 1 w; JAN type RC30BF225K.	V802 bias.	3RC30BF225K
R805	RESISTOR, variable: 5000 ohms ±20%; AB type U; Collins Rad #380575500.	Sensitivity control.	3Z7350-108
R1547, R1548	RESISTOR, variable: 5000 ohms ±5%; 2 w; Collins Rad #377002300.	R1547: Plate tuning servo potentiometer (motor). R1548: Antenna tuning servo potentiometer (motor).	3Z7350-159

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
R808	RESISTOR, fixed: comp; 33,000 ohms ±10%; JAN type RC30BF333K.		3RC30BF333K
R1513 thru R1516	RESISTOR, fixed: WW; 3100 ohms ±5%; 14 w; JAN type RW16G312.	R1513: Filament pilot series. R1514: Bias pilot series. R1515: H-v pilot series. R1516: Overload pilot series.	3RW27352
R1550, R1574	RESISTOR, fixed: comp; .19 meg ±10%; 1 w; JAN type RC30BF184K.	Blown fuse indicator series.	3RC30BF184K
R1551 thru R1554	RESISTOR, fixed: comp; 470 ohms ±10%; 2 w; JAN type RC42BF471K.	Pilot light series resister	3RC42BF471K
R-1523.1 thru .10	RESISTOR, fixed: comp; 3300 ohm p/m 10%; 1 w; characteristic ltr F; .750" lg x .280" diam; ins, humidity and RSW; 2 axial wire lead term; JAN type #RC30BF332K.	Z1504 tuning servo limit.	3RC30BF332K
R813	RESISTOR, variable: 500,000 ohms ±20%; 2 w; AB type #U; Collins Rad #380577200.	Servo amplifier.	3Z7498-50.121
R1556 thru R1561, R1565	RESISTOR, fixed: comp; 1 meg ±10%; 1 w; JAN type RC30BF105K.	Grid voltage divider for V1507.	3RC30BF105K
R814, R815	RESISTOR, fixed: comp; 330,000 ohms ±10%; 1 w; JAN type RC30BF334K.	Feedback series.	3RC30BF334K
R1301	RESISTOR, fixed: comp; 330,000 ohms ±15%; 2 w; JAN type RC42BF334J.	Output voltage divider.	3RC42BF334J
R1323	RESISTOR, fixed: comp; 270,000 ohms ±5%; 2 w; JAN type RC42BF274J.	Output voltage divider.	3RC42BF274J
R812	RESISTOR, fixed: comp; 100 ohms ±10%; 1 w; JAN type RC30BF101K.		3RC30BF101K
R803, R804	RESISTOR, fixed: comp; 100,000 ohms ±10%; 1 w; JAN type RC30BF104K.	V801 grid series.	3RC30BF104K
R1502 thru R1507	RESISTOR, fixed: WW; 2 ohms ±1%; WL type M-32.	Power amplifier cathode ammeter shunts.	3Z5942-81
R1511, R1512	RESISTOR, fixed: WW; 120 ohms ±5%; 140 w at 275°C max continuous oper temp; JAN type RW10G121.	R1511: V1504, V1505, and V1506 grid resistor. R1512: V1501, V1502, and V1503 grid resistor.	3RW18937
E1574	SHIELD, tube: cad pl steel; cylindrical w/1/2" dia hole in top; bayonet; 1-3/8" lg x .915" max ID, .810" min ID; w/ss spring inside; Johnson EF #278A.	Used on V1507.	

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
XV801, XV802	SOCKET, electron tube: 9 cont miniature; Cinch #53F12776; Collins Rad part/dwg #220 1066 00.	XV801: Mounts V801. XV802: Mounts V802.	2Z8679.57
XV1301 XV1303	SOCKET, electron tube: 7 cont miniature; Amphenol #147-501; Collins Rad part/dwg #220 1041 00.	XV1301: Mounts V1301. XV1303: Mounts V1303.	
XV1507	SOCKET, tube: 7 cont minature; above chassis base mtg; w/3/4" h metal shock shield; ctr shield .095" ID; JAN type SO10M.	Mounts V1507.	2Z8677.94
O1555B	SPIDER, coupling: type #303 steel; round, flat; 1" OD x .140" thk o/a; .437" ID for shaft mtg, milled strip .156" wd x .070" d on ea side, strip on one side at right angles to strip on other side; corrosion resistant; Collins Rad part/dwg #505 0483 002.	Part of O1555.	
O1529C	SPRING: flat type; hold-down; silver pl beryllium copper; 1-7/8" lg x 5/16" wd x 29/32" h o/a; two .171" dia mtg holes .625" c to c; Collins Rad part/dwg #504 3611 001.	Part of guide block O1529.	2Z3191-314
O1552	SPROCKET, chain: u/w link belt silent chain S-1807; 19 teeth, 3/16" pitch, PD1.139, .138" face wd; Collins Rad part/dwg #504 1921 002.	Sprocket in antenna platform drive assembly.	2Z8880-17
O1550	SPROCKET, chain: u/w link belt silent chain #S-1807; SS type #303; Collins Rad part/dwg #503 9098 002.	Drives antenna coupling lead screw.	2Z8880-12
E1516	STUD: brass, cad pl, 1-1/2" lg; 1/4"-20 NC-2 thd entire length; Collins Rad part/dwg #312 0261 00.	Ground stud.	
E1569 thru E1573	STUD: brass, cad pl; 5/8" lg o/a; .614" dia; #8-32AS-2 thd entire length; Collins Rad part/dwg #312 3120 00.	Ground stud.	
S1507	SWITCH, sensitive: SPDT; 5 amp, 250 v a-c; Micro SW type V4-14; Collins Rad part/dwg #260 0700 00.	Air interlock.	3Z9823-25.2
S1526.1 thru S1526.10	SWITCH, toggle: SPST; 15 amp, 125 v a-c; 1-9/64" h x 41/64" wd x 1-1/16" lg o/a; JAN type ST42D.	Controls PA tank shortening.	3Z9863-42A
S1506	SWITCH, toggle: DPST; 3-11/16" lg x 1-25/32" wd x 1-27/32" d excl lever; Trumbull type 2228S.	FILAMENT-START-STOP.	3Z9858-3.4
S1510A thru S1512A	SWITCH, push-pull: Navy type #-24067; male cont; bakelite body; 1-7/8" lg x 11/16" wd x 5/8" h o/a; momentary action; screw term; 2 mtg holes 5/32" dia on 1-1/4" mtg/c; Collins Rad part/dwg #260 4040 00.	S1510A: Part of door interlock S1510. S1511A: Part of door interlock S1511. S1512A: Part of door interlock S1512.	

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
S1510B S1511B S1512B	SWITCH, push-pull: 2 female cont; 2-5/16" lg x 15/16" wd x 5/8" thk x 5/8" d; GE #7460330-G4.	S1510B: Part of door interlock S1510. S1511B: Part of door interlock S1511. S1512B: Part of door interlock S1512.	3Z9560-7
S1513 ABC, S1514 ABC	SWITCH, push: Navy type #-241443; three cont normally closed by shorting disc; brass frame; 7-3/16" lg x 3-1/2" wd x 4" h o/a; momentary; four solder term; four 10-32 NF-2 mtg holes on 4-1/8" x 2-3/8" mtg/c, 8" lg shaft; Collins Rad part/dwg #503 1938 003.	Door operated grounding switch.	
S1515 ABC	SWITCH, push: 3 cont normally closed by shorting disc; brass frame; 7-3/16" lg x 3-1/2" wd x 4" h o/a; momentary; 4 solder lug term; four .218" dia mtg holes on 4-1/8" x 2-3/8" mtg/c; Collins Rad part/dwg #504 1792 003.	Door operated grounding switch.	
S1508	SWITCH, push: cont arrangement 1A; 3-9/16" lg x 2" wd x 1-3/4" h o/a; C-H Bulletin 10250H.	HV ON.	2Z9824-50.16
S1509	SWITCH, push: cont arrangement 1B; 3-9/16" lg x 2" wd x 1-3/4" h o/a; C-M Bulletin 10250H.	HV OFF.	3Z9824-50.17
S1503	SWITCH, lever: 2 position nonlocking; 3-29/32" lg x 1-1/4" wd x 1-3/4" h excl handle; Collins Rad part/dwg #503 8397 002.	Test key.	3Z9580-30.31
S1516 thru S1519	SWITCH, sensitive: single ckt; 1/2 hp at 115 or 23 v Collins Rad part/dwg #260 0849 00.	S1516, S1517: Plate tuning motor limit. S1518, S1519: Antenna tuning motor limit.	3Z9823-3.14
S1520	SWITCH, knife: DPST; 100 amp 5000 v; copper cont; nonfusible; copper body; 3-31/32" wd x 5" lg x 2-15/16" thk o/a; .203" dia mtg hole in ea clip (2), 3-29/32" c to c; Collins Rad part/dwg #504 5224 002.	Shorting switch.	3Z9817-33
S1501	SWITCH, rotary: 2 pole, 8 position; 2 decks; 7-1/2 amp at 115 v; solid silver cont; steatite sect. grade L-5; 2-13/16" h x 1-7/8" wd x 2-11/16" lg; nonshorting type cont; solder lug term. shaft 1/4" dia x 7/8" lg, mtg bushing 3/8" lg w/ mtg thd 3/8-32; Collins Rad part/dwg #259 0157 00.	D-c multimeter switch.	3Z9825-50.17
S1502	SWITCH, rotary: single pole, 4 position; single deck; 7-1/2 amp at 115 v solid silver cont; 2-13/16" h x 1-7/8" wd x 1-9/16" lg; nonshorting cont; solder lug term.; shaft 1/4" dia x 7/8" lg, mtg bushing 3/8" lg w/mtg thd 3/8-32; Collins Rad part/dwg #259 0059 00.	R-f multimeter switch.	3C341-1

9. **Identification Table of Parts for R-F Amplifier AM-738/FRT-22 (contd)**

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
S1525.1 thru S1525.10	SWITCH, rotary: 1 ckt, 1 pole, single sect.; spring silver alloy clips, coin silver alloy rotor blades; 1-1/16" lg x 1-1/4" wd x 1-5/16" h; nonshorting type cont; solder lug term.; single hole mtg, bushing 3/8"-32 NEF-2 x 1/4" lg, shaft 1/4" dia x 1-1/4" lg FMS, flush mtg; Oak type F.	Input capacity control.	
S1522	SWITCH SECTION, rotary: 1 ckt, 1 pole, 12 position, shorting type; two holes to pass #4 screw spaced 1.031" c to c, ctr mtg hole to fit 1/4" dia shaft w/flats; Oak type F.	Restart input cap.	
S1524	SWITCH SECTION, rotary: 1 ckt, 1 pole, 12 position, nonshorting type; oval; 1-7/8" lg x 1-5/8" wd x 3/16" thk; two holes to pass #5 screw spaced 1.562" c to c, ctr mtg hole to fit 1/4" dia shaft w/flats; Oak type HC.	Controls B1505.	
E1563 thru E1568	TERMINAL, stud: molded melamine body, terminal brass, tin dipped, insert, brass cad pl; 23/32" lg o/a; 17/32" lg less term; 1/4" dia; #4-40 NC-2 tapped 3/16" d one end, slotted solder lug other end; Whitso Inc #103-A-1.	E1563 thru E1565: Tie point for B1504 leads. E1566 thru E1568: Tie point for B1505 leads.	3G350-79
T801	TRANSFORMER, AC: Navy type #304899; 200 uv max oper level; 2.500" lg x 1.639" dia o/a; Collins Rad part/dwg #677 0265 00.	Input.	2Z9861.506
T1505	TRANSFORMER, power: fil type; 2500 v rms test v; 5-7/8" lg x 5-5/16" wd x 6-1/8" h o/a; Collins Rad part/dwg #662 0106 00.	Pre-set tuning control power.	2Z9600.175
S1504, S1505	SWITCH, rotary: 2 pole, 4 position; 4 decks; 10 amp, 125 v a-c, 5 amp 250 v, 3 amp 440 v; silver pl brass cont; 2-7/8" OD x 2-1/32" h excluding shaft, shaft 1-1/8" lg from mtg surface; nonshorting type cont; two 13/64" dia mtg holes on 2.093" mtg/c; Electro SW Corp #23.	PA Filament voltage adjustor.	3Z9825-50.18
T1501, T1502	TRANSFORMER, power: fil type; input 230 v a-c, 60 cps, single ph; 3 output wnd; secd #1, #2, #3, ea to deliver 9.5 v at 48 amp; encl metal case; 15-1/16" lg x 9-1/16" wd x 12-5/8" h o/a; 13 term. on side of case; 4 mtg slots on 5-17/32" x 14-5/16" mtg/c; Thordarson T-51306A.	Power-amplifier filament transformers.	2Z9600-169
T1503	TRANSFORMER, power: Navy type #-302642; fil type; input 250 v tapped at 210 v, 220 v, 230 v, 240 v, 50/60 cps; secd 6.3 v at 3.0 amp CT; varnish impr, compound filled; HS metal case; 4" lg x 2-11/16" wd x 3-7/8" h excluding term.; nine 8-32 screw term. on bottom of case; six 7/32" dia mtg holes, 3 on ea side spaced 3/4" x 3-1/2" c to c; Chi Trans type #C2B1-10.75.	Voltmeter filament transmitter.	2Z9600.172

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
V1501 thru V1506	ELECTRON TUBE: Eimac #3X2500-A3.	V1501: PA AMP. V1502 thru V1506: Power amplifier.	2J3X2500-A3
V802	ELECTRON TUBE: JAN type 12AU7.	Output stage.	2J12AU7
V1507	ELECTRON TUBE: JAN type 5696.	Pre-set channel sequence control.	2J5696
V801	ELECTRON TUBE: JAN type 12AX7.	Input stage.	2J12AX7
V1301, V1303	ELECTRON TUBE: JAN type 6X4W.	Part of Z513 thru Z516.	2J6X4W
XV1501 A thru XV1506 A	TUBING: tube air duct; heatproof glass, grade L-4; 11-7/64" OD max, 10-17/64" ID min, 4" lg, 1/4" thk; Collins Rad part/dwg #192 1013 00.	XV1501A, XV1502A, XV-1503A: Used to mount V1501, V1502, and V1503. XV1504A, XV1505A, XV-1506A: Used to mount V1501, V1502, and V1503.	6Z3660-13
W1503	CABLE ASSEMBLY, special purpose: electrical; 11 #18 AWG cond; 10 ft lg o/a; 1 end Cannonelec plug #DPD-45-33S-1, other end Cannonelec plug #DPD-45-34P; Collins Rad part/dwg #506 7094 005.	Cable from cabinet to lower front door.	3E4002.138
O1579, O1580	WORM, gear: SS type #303; 1 LH thd, 48 pitch, .333PD; cylindrical; 9/16" lg x 3/8" OD; .188" ID for mtg; Collins Rad part/dwg #506 7649 002.	B1504 pinion.	

10. Identification Table of Parts for Power Supply Assembly PP-1089/FRT-22

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
1601-1699 series	POWER SUPPLY ASSEMBLY PP-1089/FRT-22: bias supply, rect, 500 v output, 1.5 amp d-c; h-v supply, rect, 5500-6000 v, 11 amp d-c; a-c, 230 v, 60 cyc, bias supply 1-ph, h-v 3-ph; case sheet steel; 43" wd x 40-1/4" d x 72" h o/a; cabinet mtg; MIL-R-11181 (Sig C); Collins Rad.	For supplying power to radio transmitter.	3H4497-515
E1608, E1613	BOARD, terminal: general purpose binding post strip; 4 screw term; 9/16" c to c, w/barriers; molded phenolic board; 3-7/32" lg x 1-5/16" wd x 5/8" thk o/a; four .209" dia mtg holes on 2-13/16" x 1/2" mtg/c; Jones HB type 142.	E1608: Inter-cabinet connections. E1613: Blower term board for B1601.	
B1601	BLOWER: motor; 1/6 hp 1750 rpm 50/60 cps 1-ph 230 v a-c; 630 cfm at 1750 rpm; 14-3/8" lg x 11-3/4" wd x 12-1/2" h o/a; Ilg Elec cat. #B-12.	Circulates air in power supply cabinet.	3H388-69

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
C1601, C1602, C1608, C1609	CAPACITOR, fixed: paper dielectric; 2 uf ±10%; 7500 vdcw; JAN type #CP70D1FR205K.	HV filter.	
K1601 thru K1606	CIRCUIT BREAKER: magnetic; cont arrangement; 2 normally closed; a-c noninductive 115 v 5 amp, 230 v 2 amp, 460 v 1 amp, d-c noninductive 24 v 5 amp, 48 v 2 amp, 125 v 1 amp, 250 v .3 amp, calibration range 1 to 4 amp, 3 amp continuous; GE #12PJC11AA2.	K1601: For V1501 DC overload. K1601: For V1502 DC overload. K1602: For V1503 DC overload. K1603: For V1504 DC overload. K1604: For V1505 DC overload. K1605: For V1506 DC overload. K1606: For V1507 DC overload.	3H900-5-29
K1607	CIRCUIT BREAKER: sol type; DPST, normally closed; a-c noninductive 115 v 5 amp, 230 v 2 amp, 460 v 1 amp, d-c noninductive 24 v 5 amp, 48 v 2 amp, 125 v 1 amp, 250 v .3 amp, calibration range 4 to 16 amp, 12 amp continuous; textolite case; 5-7/16" lg x 2-1/2" wd x 5-13/16" h o/a; instantaneous action; manual reset, trip free, pushbutton type; 2 mtg holes tapped 10-32 NF-2 4-3/8" c to c; GE #12PJC11AA4.	H-v overload.	3H900-5-23
K1608	CIRCUIT BREAKER: sol; DPST, 1 normally open, 1 normally closed; a-c noninductive 115 v 5 amp, 230 v 2 amp, 460 v 1 amp, d-c noninductive 24 v 5 amp, 48 v 2 amp, 125 v 1 amp, 250 v .3 amp, calibration range .5 to 2 amp, 1.5 amp continuous; textolite case; 5-7/16" lg x 2-1/2" wd x 5-13/16" h o/a; instantaneous action; manual reset, trip free, pushbutton type; 2 mtg holes tapped 10-32 NF-2 4-3/8" c to c; GE #12PJC11AA1.	Bias under voltage.	3H900-5-22
S1601	CIRCUIT BREAKER: armature; TPST; 8.0 amp a-c, 250 v d-c and a-c continuous rated load, 5000 amp interrupting; bakelite case; 5-1/4" lg x 2.984" wd x 4-9/32" d o/a; time delay 5 sec at 125%, .8 sec at 200%, .2 sec at 300% continuous load rating -- trip free; toggle action manual reset; four tapped #8-32 NC-2, 7/32" d mtg holes on .980" x 4.359" mtg/c; Heinemann cat. #3363S-8 (curve #3).	Blower breaker.	3H900-8-4
S1602	CIRCUIT BREAKER: magnetic; double pole; 230 v 5 amp; a-c, 250 d-c; Heinemann cat. #2263S.	BIAS circuit.	3H900-5-24

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
S1604	CIRCUIT BREAKER: armature; TPST; 230 v, 5 v a-c, 250 v d-c; bakelite case; 5-1/4" lg x 2.984" wd x 4-9/32" d o/a; toggle action manual reset; four tapped #8-32 NC-2, 7/32" d mtg holes .980" x 4.359" mtg/c; Heinemann cat. #3363S-5.	RECT FIL breaker.	3H900-5-19
S1603	CIRCUIT BREAKER: magnetic; double pole; 230 v, 15 amp a-c, 250 v d-c; Heinemann cat. #2263S.	CONTROL CIRCUIT.	3H900-15-46
S1605	CIRCUIT BREAKER: magnetic; 3 pole; 230 v a-c/ 250 v d-c max, 50 cont amp; bakelite case; 5-1/4" lg x 2.984" wd x 2-11/16" d excluding term. and toggle; 5 sec time delay; toggle action manual reset; 4 mtg holes on .980" x 4.359" mtg/c; Heinemann cat. #3363S.	PA FILAMENT.	3H900-50-25
S1607	CIRCUIT BREAKER: magnetic; double pole; 230 v, 2 amp a-c, 250 v d-c; Heinemann cat #2263S.	SERVO CONTROL breaker.	3H900-2-6
E1617	CLIP, electrical: electron tube; ceramic insulation; 7/32" dia wire entrance hole; Natl Co. #SPP-9.	Rectifier tube cap.	2Z2725.2
E1628	CLIP, electrical: fuse; for 1-1/8" dia cartridge fuse; 1-1/8" max jaw opening; Electric Co type #2026-S.	Resistor and capacitor mounting clip.	2Z2712.203
E1629	CLIP, electrical: fuse; 13/16" max jaw opening; multi; Electric Co type #2022-J	Resistor and capacitor mounting clip.	2Z2712.420
E1630	CLIP, electrical: fuse; 9/16" max jaw opening; multi; Electric Co #2020-J.	Resistor and capacitor mounting clip.	2Z2712.421
K-1611F, K-1621C	COIL, relay: single wnd coil; 220 v; Size 0; AB #OA02-B.	K1611F: Filament contactor. K1621C: HV auxiliary.	3C1112-11
K-1612C K-1613C	COIL, solenoid: #32 AWG E copper wire; 220 v, 50 cps; single wnd coil, 2 screw term.; rectangular; 1-7/8" lg x 1-1/2" wd x 1-1/8" thk o/a; mtd thru ctr hole; AB cat. #1A07-B; for 50 cps operation.	K1612C: Part of solenoid relay K1612. K1613C: Part of solenoid relay K1613.	3C1999-37A
K-1612C, K-1613C	COIL, solenoid: #32 AWG E copper wire; 230 v, 60 cps, 145 ohms d-c res; 2420 turns, single wnd, 2 screw term.; rectangular; 1-7/8" lg x 1-1/2" wd x 1-1/8" thk o/a; mtd thru ctr hole; AB cat. #RC-2-3406; for 60 cps operation.	K1612C: Part of solenoid relay K1612. K1613C: Part of solenoid relay K1613.	3C1112-1
P1601	CONNECTOR, plug: 30 round female cont; 90° angle; Cannonelec cat. #IK-30-23C-1.	Connects upper front door to cabinet.	2Z3082-134
P1602	CONNECTOR, plug: 30 round male cont; 90° angle; Cannonelec cat. #RIK-30-240-1-1/8.	Connects upper front door to cabinet.	2Z3046.46
J1601	CONNECTOR, receptacle: 30 round female cont; straight; Cannonelec type #RIK-30-31SL.	Connects upper door to cabinet.	2Z3082-135

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
J1602	CONNECTOR, receptacle: 30 round male cont; straight; Cannonelec type CK-30-32S.	Connects upper door to cabinet.	2Z3046.47
K-1601A thru K-1608A	CONTACT, electrical: stationary flex type; L-shape; GE type #K-6174439G1.	K1601A: V1501 DC overload. K1602A: V1502 DC overload. K1603A: V1503 DC overload. K1604A: V1504 DC overload. K1605A: V1505 DC overload. K1606A: V1506 DC overload. K1607A: HV overload. K1608A: Bias under voltage.	2Z3193-197
K-1601B thru K-1608B	CONTACT, electrical: movable flex type; straight; GE type #617444OG-1.	K1601B: K1501 DC overload. K1602B: V1502 DC overload. K1603B: V1503 DC overload. K1604B: V1504 DC overload. K1605B: V1505 DC overload. K1606B: V1506 DC overload. K1607B: HV overload. K1608B: Bias under voltage.	2Z3193-198
K-1611E, K-1616C, K-1617C, K-1619C	CONTACT, electrical: movable, clapper type; straight; AB type #X-68996.	K1611E: FILAMENT contactor. K1616C: BIAS CONTROL: K1617C: HV auxiliary. K1619C: Main breaker auxiliary.	2Z3202-1/3
K-1612A, K-1613A	CONTACT, relay: stationary point type; silver alloy cont welded to special hex. bolt; 25 amp; 3/8" across flats, 41/64" lg; threaded 12-24; corrosion resistant; AB type X-33519.	K1612A: Part of solenoid relay K1612. K1613A: Part of solenoid relay K1613.	2Z7593-11/2
K-1612B K-1613B	CONTACT, relay: movable type, rigid; 2 silver cont round, 3/8" dia; 25 amp; straight, 1-9/32" lg x 1/2" wd x 11/64" thk o/a; mtg hole 17/32" c to c from either cont; single mtg hole in ctr; AB type #X-33552.	K1612B: Part of solenoid relay K1612. K1613B: Part of solenoid relay K1613.	2Z3190-334

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
K-1611A	CONTACT ASSEMBLY, electrical: 10 amp, noninductive; w/4 screw term.; AB type #X-48680.	Filament contactor.	2Z7684/1
	CONTACT ASSEMBLY, electrical: p/o relay; 250 v a-c 6 amp; AB part #13770S.		2Z7684/2
K-1611C, K-1617A, K-1619A	CONTACT ASSEMBLY, electrical: 10 amp, noninductive; p/o relay; AB type #X-48690.	K1611C: Filament contactor. K1617A: HV auxiliary. K1619A: Main breaker auxiliary.	2Z3197A-51
K-1611D, K-1617B, K-1619B	CONTACT ASSEMBLY, electrical: p/o relay; 10 amp, noninductive; AB type #X-48691.	K1611D: Filament contactor. K1617B: HV auxiliary. K1619B: Main breaker auxiliary.	2Z3197A-52
K-1616A	CONTACT ASSEMBLY, electrical: p/o relay; 10 amp, noninductive; AB type #X-48692.	BIAS control.	2Z3197A-49
K-1616B	CONTACT ASSEMBLY, electrical: p/o relay; 2 normally open, right-hand cont; AB type #X-48693.	BIAS control.	2Z3197A-48
K-1621A	CONTACT ASSEMBLY, electrical: p/o relay; 2 normally open, 2 normally closed, left-hand cont; AB type #48682.	HV auxiliary.	2Z3197A-47
K-1621B	CONTACT ASSEMBLY, electrical: p/o relay; 2 normally open, 2 normally closed; right-hand cont; AB type #X48683.	HV auxiliary.	2Z3197A-43
O1601	CLEANER, air: spun glass dust stop; cartridge type; Collins Rad part/dwg #009 2070 00.	Dust filter.	
F1601 thru F1607	FUSE, cartridge: 1 amp, blow time 0-1 hr at 135% load, 60 sec max 5 sec min at 200% load, rated continuous at 110% load; Littelfuse #313001, type #3AG.	F1601: T1601 primary fuse. F1602: T1602 primary fuse. F1603: T1603 primary fuse. F1604: T1604 primary fuse. F1605: T1604 primary fuse. F1606: T1606 primary fuse. F1607: T1607 primary fuse.	3Z2601.16
XF-1601 thru XF-1607	HOLDER, fuse: extractor post type; 250 v, 15 amp; Buss type #HKP-Q-LR.	XF1601: Mounts F1601. XF1602: Mounts F1602. XF1603: Mounts F1603. XF1604: Mounts F1604.	3Z3282-42.9

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
		XF1605: Mounts F1605. XF1606: Mounts F1606. XF1607: Mounts F1607.	
E1616	INSULATOR, bowl: cup shape; JAN type NS4W460.	Rectifier HV feedthru.	3G3546-01.2
E1624	INSULATOR, stand-off: cylindrical; JAN type NS4W0308.	Resistor mounting.	3G3503-08.1
E1618, E1621	INSULATOR, stand-off: cylindrical pillar; JAN type NS4W0312.	E1618: HV rectifier tube socket mounting. E1621: Resistor mounting.	3G3503-12.2
E1619	INSULATOR, stand-off: round post shape; JAN type NS4W0316.	For bias rectifier tube socket mounting.	3G3503-16.3
E1626	INSULATOR, stand-off: cylindrical shape; JAN type NS4W0324.	Resistor mounting.	3G3502-24.2
E1620	INSULATOR, stand-off: conical shape; JAN type NS4W2016.	Resistor mounting.	3G3520-16.1
E1642	INSULATOR, stand-off; cylindrical pillar; grade L-5 ceramic; Centralab #2X783.	Tie point for R1668, and R1669.	3G350-128
E1623	INSULATOR, stand-off: cylindrical pillar; grade L-4 ceramic, white, glazed; Collins Rad part/dwg #190 1173 00.	Resistor mounting.	3G350-201
E1627	INSULATOR, stand-off: round post shape; grade L-4 ceramic; Collins Rad part/dwg #190 1176 00.	Resistor mounting.	3G1250-64.18
E1611	INSULATOR, stand-off: cylindrical pillar; grade L-4 ceramic, white glaze; 2-45/64" lg o/a; 1" OD less bkt, bkt 3-1/4" lg x 1" wd, 2 mtg slots 5/16" lg x 3/16" wd on ctr line 1-3/4" c to c; includes 2 ext shakeproofs, two 1/4"-20 hex. nuts, 1/4" flat washer, 1/4" corprene washer on 1/4"-20 x 1" stud at one end, 1/4 ext shakeproof, 1" corprene washer on 1/4"-20 x 5/8" screw on other end; Collins Rad part/dwg #503 8427 002.	H-v terminal.	3D350-138
E1625	INSULATOR, stand-off: round post shape; grade L-4 ceramic; white glaze; 1.5" lg; 1" dia o/a tapped 1/4"20 x 1/2" d at ea end; Collins Rad part/dwg 190 1172 00.	Resistor mounting.	3G3504-12.1
E1633, E1634	KNOB: round; aluminum, black anodize finish; for 3/8" diam shaft; 2 holes tapped 8-36 NF-2 x 9/16" d 90 deg apart; 2-1/2" diam x 15/16" thk o/a; 5/8" d shaft hole; diamond knurl; Collins Rad part/dwg #504 4617 002.	E1633: Left PA filament dial. E1634: Right PA filament dial.	

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
E1636	KNOB: round; for 1/4" dia shaft; engraved white line 1/4" lg; Collins Rad part/dwg #502 9138 002.		2Z5824.132
E1635	KNOB: round; black bakelite; for 3/8" dia shaft; insert tapped 10-32 NF-2, two holes, 90° apart; white line in circle on .812" radius; 3" dia x 1.281" thk o/a; brass insert; .875" d shaft hole; Collins Rad part/dwg #503 8168 003.	PA BIAS dial.	2Z5822-542
I1610 thru I1616	LAMP, glow: 110 to 120 v a-c or d-c, 1/10 w; Littelfuse type #201 001.	I1610: F1501 failure indicator. I1611: F1502 failure indicator. I1612: F1503 failure indicator. I1613: F1504 failure indicator. I1614: F1505 failure indicator. I1615: F1506 failure indicator. I1616: F1507 failure indicator.	2Z5889-27
I1601 thru I1609	LAMP, incandescent: 120 v 6w; double cont bayonet candelabra base; Collins Rad part/dwg #262 0041 00.	I1601: M1601 lamp. I1602: M1602 lamp. I1603: M1603 lamp. I 1604, 1605, 1606, 1607: Pilot light in power unit. I 1608, I 1609: Limit light for B1701 in T1701.	6Z6810-6
XI-1601 thru XI-1603	LAMPHOLDER: double cont candelabra bayonet base; Dialco #9-S-4634-L-46.		2Z5988-39
XI-1604A, XI-1607A	LENS, indicator light: amber; Collins Rad part/dwg #262 010600.	XI1604A: Part of indicator light XI1604. XI1607A: Part of indicator light XI1607.	2Z6125-262
XI-1605A, XI-1609A	LENS, indicator light: green; Collins Rad part/dwg #262 010500.	XI1605A: Part of indicator light XI1605. XI1609A: Part of indicator light XI1609.	2Z6125-263
XI-1606A, XI-1608A	LENS, indicator light: red; Collins Rad part/dwg #262 010400.	Part of indicator lights XI1606 & 1608.	2Z6125-264
XI-1604 XI-1609	LIGHT, indicator: w/o lens; for double cont candelabra bayonet base bulb; Dialco type #51702-67.	Mounts I1604 thru I1609.	2Z5991-377

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
M1604, M1605	METER, time: elapsed time indicator; sync self-starting clock motor; 230 v 60 cyc; Weston type 691.	Elapsed time indicators.	3F3359-1
M1601	METER, voltmeter: d-c; scale marking 0-8 kv, rectangular, black flush mtd phenolic case; 3.7" x 3.950" body, 1.625" d behind fl, 4" x 4.250" x 3/16" fl; ±1% accuracy for full-scale reading; 0-1 ma d-c; calibrated for 3/32" thick steel panel; 40 scale divisions, black markings on white background; window in top of case for illumination; includes ext multiplier; two mtg lugs fastened on bottom of case, two 8-32 NC-2 x 1-1/4" screws; two screw type term. 1/4"-28 NF-2, 3/4" lg; Weston type #741.	PA PLATE VOLTAGE meter.	3F13800-4
M1602	METER, voltmeter: a-c 25 to 125 cyc; range 300 a-c v; rectangular flush mtg black phenolic case; .370" x 3.950" body, 2-5/32" d behind fl, 4" x 4.250" x 3/16" fl; 1% accuracy; calibrated for 3/32" thk steel panel; 60 scale divisions, black markings on white background, window in top of case for illumination; resistor supplies; two mtg lugs fastened on bottom of case, two #8-32 NC-2 x 1-1/4" screws; two screw type term. 1/4"-28 NF-2 x 3/4" lg; Weston model #744.	LINE VOLTAGE meter. Includes line voltmeter multiplier R1665.	3F8300-58
M1603	METER, voltmeter: a-c, 25 to 125 cyc; range 10 a-c v; rectangular, black phenolic flush mtg case; 3.70" x 3.950" body, 2-5/32" d behind fl, 4.00" x 4.250" x 3/16" fl; 1% accuracy; calibrated for 3/32" thk steel panel; 50 scale divisions, black markings on white background window in top case for illumination; self-contained; 2 mtg lugs fastened on bottom of case, two #8-32 NC-2 x 1-1/4" screws; 2 screw type term. 1/4"-28 NF-2, 3/4" lg; Weston model #744.	PA FILAMENT VOLTAGE.	3F8010-28
L1601	REACTOR: filter choke; single sect.; .5 hy ±20% 1.6 ohms res; steel case; 16-1/4" lg x 12-5/8" wd x 16-1/2" h excluding term.; four 9/16" dia mtg holes 12" x 7-3/8" mtg/c; 2 ceramic bushings w/adj spark cap on top; Collins Rad part/dwg #678 0266.	H-v filament choke.	3C574K-5
L1602	REACTOR: filter choke; single sect.; 1.5 hy, 1.5 amp; 10 ohms d-c res; HS metal case; 9" h x 9-1/8" lg x 6-3/8" wd excluding term.; 4 mtg holes 3/8" wd x 3/8" d w/3-1/4" x 8-7/16" mtg/c; 2 screw type thru ceramic bushings term. on side; Thordarson type #T-51355.	Power amplifier bias supply filament choke.	3C570-19
K1614	RELAY, motor driven: cont arrangement 1-C; 230 v, 60 cyc 1-ph motor; Cramer RW type TE.	Timer contactor.	2Z7599A-263

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
K1615	RELAY, motor driven: cont arrangement 1B; 230 v., 60 cyc 1-ph motor; Cramer RW type TEC.	Timer contactor.	2Z7599A-265
K1615 (ALT)	RELAY, motor driven: cont arrangement 1B; 230 v; 50 cyc 1-ph sync motor; Cramer RW type TEC.	Timer contactor.	2Z7599A-495
K1617, K1619	RELAY, solenoid: 3 pole normally open; single wnd coil; oper voltage 220 v, 50 cps; ins coil; AB type B-300, Bul 700.	K1617: L-V auxiliary. K1619: Main breaker auxiliary.	2Z7593-150
K1611	RELAY, solenoid: 7 poles normally open; single wnd coil; oper voltage 22 v, 50 cps; ins coil; AB type B-700, Bul 700.	Filament contactor.	2Z7597-19
K1616	RELAY, solenoid: 2 pole normally open; single wnd coil; oper voltage 220 v, 50 cps; ins coil; AB type B-200, Bul 700.	Bias control.	2Z7590-221
K1612	RELAY, solenoid: 3 poles, 1 normally open; silver cont; single wnd coil, oper voltage 220 v, 50 cps; screw type term. on coil and cont; 5-7/8" lg x 4" wd x 3" h o/a; two .203" dia mtg holes spaced 2-5/8" c to c; Collins Rad part/dwg #405 0353 00.	Blower contactor.	2Z7509A-515
K1612	RELAY, solenoid: 3 PST normally open, 1 normally open aux cont; cont rating 25 amp, 600 v a-c noninductive; silver alloy cont; single wnd coil, 60 cps, 220 v a-c; screw type term. on coil and cont; 5-7/8" lg x 4" wd x 3" h approx o/a; three .203" dia mtg holes, 2 holes spaced 2-5/8" c to c, at base of triangle formed by mtg holes and third hole 4-15/16" from base; fast acting; Collins Rad part/dwg #405 0135 00.	Blower contactor.	2Z7587-323
K1613	RELAY, solenoid: 4 poles, 1 normally open, 1 normally closed; cont rating 25 amp, noninductive load 600 v; silver cont; single wnd coil, oper voltage 220 v, 50 cps, screw type term. on coil and cont; 5-7/8" lg x 4" wd x 3" h o/a; two .203" dia mtg holes spaced 2-5/8" c to c; Collins Rad part/dwg #405 0363 00.	Power amplifier filament contactor.	2Z7599A-514
K1613	RELAY, solenoid: 4 PST, normally open, 1 normally open and 1 normally closed aux cont; cont rating 25 amp, 600 v a-c; silver alloy cont; single wnd coil, 60 cps, 220 v a-c screw type term. on coil and cont 5-7/8" lg x 4" wd x 3" h approx o/a three .203" dia mtg holes, 2 holes spaced 2-5/8" c to c at base of triangle formed by mtg holes and third hole 4-15/16" from base; fast acting; Collins Rad part/dwg #405 0145 00.	Power amplifier filament contactor.	2Z7599A-316
K1621	RELAY, solenoid: Navy type #-29454; 4 PST cont, 2 normally open, 2 normally closed; cont rating 10 amp 600 v a-c silver alloy cont; single wnd coil, 220 v a-c not pol, screw type term. on coil and cont; 3-5/8" lg x 3-1/8" wd x 3-7/16" h o/a;	H-v auxiliary.	2Z7593-157

10. Identification Table of Parts for Power Supply Assembly PP-1089/FRT-22 (contd)

Ref. symbol	Name of part and description	Function of part	Signal Corps stock No.
	three 11/64" dia mtg holes on 2-1/4" x 2-1/8" mtg/c; fast acting; AB Bul 700, type B-220.		
R1601, R1602	RESISTOR, fixed: WW; 4 meg; ±1/2%; 4.0 kv max 4.0 w; JAN type MFA405.	D-c voltmeter multiplier.	3RM400-1
R1603	RESISTOR, fixed: comp; WW; 16,000 ohms ±5%; 40 w; JAN type RW14G163.	D-c voltmeter shunt.	3RW31524
R1641 thru R1645	RESISTOR, fixed: WW; 3100 ohms ±5%; 14 w; JAN type RW16G312.	R1641: Meter light series. R1642: Filament pilot light series. R1643: Bias pilot light series. R1644: H-v pilot light series. R1645: Overload pilot light series.	3RW27352
R1646 thru R1657	RESISTOR, fixed: WW; 2.3 ohms ±20%; power rating 6.3 amp continuous; 3-1/8" lg x 2-1/16" wd x 2-21/32" h excluding term.; open wnd; two #10-32 NC-2 screw term.; two 5/16"-18 NC-2 x 1-3/16" lg mtg studs; GE cat. #CR9033B1C23.	R1646 thru R1657: H-v rectifier load dividing.	3Z5992C3-1
R1620 thru R1623	RESISTOR, fixed: 4.5 ohms ±10%; power rating 12.7 amp continuous, 730 w; 15-1/8" lg x 2-1/16" wd x 2-21/32" h excluding term.; open wnd; two #10-32 NC-2 screw term.; two 5/16"-18 NC-2 x 1-3/16" lg mtg studs; GE cat. #CR9033B5C45.	R1620 thru R1623: Part of h-v supply surge limiting.	3Z599486-1
R1628 thru R1637	RESISTOR, fixed: JAN type RW10G310; 31 ohms ±5%; 140 w.	R1628 thru R1637: Part of bias supply bleeder.	3RW15341
R1624 thru R1627	RESISTOR, fixed: JAN type RW16F500; 50 ohms ±5%; 14 w.	R1624 thru R1627: Bias rectifier load dividing.	3RW16506
R1614 thru R1619	RESISTOR, fixed: JAN type RW10G800; 80 ohms ±5%; 140 w.	R1614 thru R1619: Part of h-v filter reactor shunt.	3RW17728
R1604 thru R1613	RESISTOR, fixed: WW; JAN type RW10G404; 4000 ohms ±5%; 140 w.	R1604 thru R1613: Part of h-v bleeder.	3RW27952
R1639, R1640	RESISTOR, variable: WW; 2.5 ohms ±10% ea sects; 225 w; 3 solder lug term. ea sect; 5" dia body x 7" dia bkt x 5-13/16" lg body sliding brush type; shaft, flatted 23/32" from end, normal to flat 90° from cont arm, 3/8" dia x 7/8" lg from mtg surface; lin taper; four 1/4"-20 tapped mtg holes on top and bottom of frame spaced 7/8" x 2-1/2" c	R1639: Left panel assembly filament voltage adjustment. R1640: Right panel assembly filament voltage adjustment.	3Z7002E5

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	to c, 2 panel mtg holes spaced 1-3/4" c to c; Collins Rad part/dwg #749 7676 00.		
R1638	RESISTOR, variable: JAN type RP401FG500KK; 50 ohms ±10%; 300 w.	Bias adjusting potentiohmeter.	3RP4810
R1658 thru R1664	RESISTOR, fixed: comp; 180,000 ohms ±10%; JAN type RC30BF184K.	Blown fuse indicator series.	3RC30BF184K
R1668, R1669	RESISTOR, fixed: WW; comp; 470 ohms ±10%; 2 w; JAN type RC42BF471K.	R1668: Meter light I1601 series. R1669: Meter light I1602 series.	3RC42BF471K
R1672.1 thru R1672.10 R1673.1 thru R1673.10	RESISTOR, variable: 10,000 ohms ±5%; 2 w; 2 w at 40°C continuous oper temp, solder lug term.; case 3/4" dia x 1-3/8" lg; encl case; round shaft; metal; .125" dia x 11/16" lg FMS; lin taper; cont arm ins, 10 turn, minature, 3600 deg rotation; average starting torque .75 ounce-inch average running torque .60 ounce-inch; bushing 1/4"-32 NEF-2 x 5/8" lg; Collins Rad part/dwg #377 0230 00.	R1672.1 thru R1672.10: Z1503 servo panel resistor. R1673.1 thru R1673.10: Z1504 servo panel resistor.	
XV1601 thru XV1612	SOCKET, electron tube: 4 cont jumbo; bkt mtd under chassis; Johnson EF type #123-211S.	Mounts V1601 thru V1612.	2Z8759-3
XV1613 thru XV1616	SOCKET, electron tube: 4 cont med size; integral hole mtd; Johnson EF #123-209-51.	Mounts V1613 thru V1616.	2Z8759.4-1
E1612, E1614	STUD: brass, cad pl; 1-1/2" lg; 1/4"-20 NC-2 thd entire length; Collins Rad part/dwg #312 0261 00.	E1612: Grounds stud. E1614: Inter cabinet connections.	
S1610	SWITCH, push: cont arrangement 1 B; C-M Bul 10250H.	HV OFF.	3Z9824-50.17
S1620	SWITCH, lever: 2 position, non-locking; Collins Rad part/dwg #503 8397 002.	Test key.	3Z9580-30.31
S1609	SWITCH, push: cont arrangement 1 A; C-H Bul 10250H.	HV ON.	3Z9824-50.16
S1611A thru S1613A	SWITCH, push-pull: Navy type #-24067; male cont; bakelite body; 1-7/8" lg x 11/16" wd x 5/8" h o/a; momentary action; screw term; 2 mtg holes 5/32" dia on 1-1/4" mtg/c; Collins Rad part/dwg #260 4040 00.	S1611A: Part of door interlock S1611. S1612A: Part of door interlock S1612. S1613A: Part of door interlock S1613.	
S1611B thru S1613B	SWITCH, push-pull: 2-female cont; GE #7460330-G4.	Part of door interlocks S1611 thru S1613.	3Z9560-7

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
S1614 ABC thru S1619 ABC	SWITCH, push: Navy type #-241443; three cont normally closed by shorting disc; brass frame; 7-3/16" lg x 3-1/2" wd x 4" h o/a; momentary; four solder term; four 10-32 NF-2 mtg holes on 4-1/8" x 2-3/8" mtg/c; 8" lg shaft; Collins Rad part/dwg #503 1938 003.	Door operated grounding switch.	
S1606	SWITCH, toggle: IPST; Trumbul type 2228S.	FILAMENT-START-STOP.	3Z9858-3.4
S1608	SWITCH, rotary: 5 pole, 4 position, 2 throws; 5 decks; 10 amp 120 v a-c, 5 amp 240 v, 3 amp 440 v; brass cont, cad pl; 2-7/8" OD x 2-5/16" h; shaft 29/32" lg from mtg surface; shorting type cont; screw term.; two 13/54" dia mtg holes on 2.093" mtg/c; Collins Rad part/dwg #260 0855 00.	PA CONTROL switch.	3Z9825-92.17
S1621	SWITCH, rotary: 6 pole, 6 position; double deck; 7-1/2 amp at 115 v; solid silver cont; 2-13/16" h x 2-1/16" wd x 2-11/16" lg; non-shorting type cont; solder lug term.; shaft 1/4" dia x 1/2" lg, mtg bushing 3/8" lg w/mtg thd 3/8-32; Collins Rad part/dwg #259 0314 00.	A-c multiplier meter switch.	3Z9825-50.19
S1622	SWITCH, rotary: DPDT, 3 pos; 4 decks; 10 amp 125 v, 5 amp 250 v, 3 amp 440 v; silver pl brass cont; 2-7/8" OD x 2-1/32" h excluding shaft; shaft 1-1/8" lg from mtg surface; non-shorting type cont; momentary, normally open; screw term.; two 13/64" dia mtg holes on 2.093" mtg/c; Collins Rad part/dwg #260 0354 00.	Plate voltage control.	3Z9825-92.18
T1601 thru T1606	TRANSFORMER, power: fil type input 220 v 230 v, 240 v, 50/60 cps 1-ph; single output wnd; secd 5.0 v at 30 amp CT; pri 2500 v, secd 15,000 v test; inclosed metal case; 6.500" lg x 6.120" wd x 7-1/8" h less term.; 4 screw type term. 1/2" lg, 3 screw type term. w/ceramic bushings 2-5/8" lg, located on bottom of case; six .0625" dia mtg holes, 3 on ea side spaced 2.125" x 6.000" c to c; electrostatic shield between pri and secd; Collins Rad part/dwg #672 0152 00.	T1601 thru T1606: H-v rectifier filament.	2Z9600.164
T1607	TRANSFORMER, power: input 220 v, 230 v, 240 v, 50/60 cps, 1-ph; single output wnd; secd 2.5 v at 20.0 amp CT; inclosed metal case; 4.000" lg x 3.230" wd x 4.230" h less term.; 7 screw type term. on bottom of case; six .220" dia mtg holes, 3 on ea side spaced 1.125" x 3.500" c to c; Chi Trans cat. #13094.	Bias rectifier filament.	2Z9600.171
T1608	TRANSFORMER, power: plate type; input 208 v, 230 v, 50/60 cps, 1-ph; single output wnd; secd 1180 v at 1.5 amp CT; pri 2500 v, secd 5000 v test; inclosed metal case; 11-5/8" lg x 7-9/16"	Bias plate.	2Z9600.170

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	wd x 9-3/4" h excluding term.; 6 screw type term. w/ceramic bushings 1-1/8" lg located on side of case spaced 1-1/4" x 2" c to c; four 7/16" wd mtg slots on 10-3/4" x 4-1/4" mtg/c; Thordarson type T-51354.		
V1601 thru V1612	TUBE, electron: type 4B32.	HV rectifiers.	2J4B32
V1613 thru V1616	TUBE, electron: type 3B28.	Bias supply rectifiers.	2J3B28

11. Identification Table of Parts for Power Control C-598/FRT-6 and Power Transformer TF-197/FRT-22

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
1701 1799	POWER CONTROL C-598/FRT-6: 38-1/2" lg x 14-3/4" wd x 24-1/2" h o/a; controls all the amplifier power plate to the transmitter; Collins Rad part/dwg #503 9833 005.	Plate control tune operate.	3H1099-598
T1701B	BRUSH ASSEMBLY, electrical contact: Morganite EG3X; 4-1/4" lg x 1" wd x 1-1/4" h o/a; Superior Elec #BP1007.	Brushes for T1701A.	3H535C-3
K1701C	BRUSH SET, electrical contact: carbon grade EG3X; rectangular, 11/16" lg x .279" wd x .216" thk; shunt 1" lg, ea brush (2), o/a Collins Rad part/dwg #260 0786 00.		3H525F3
F1701, F1702	FUSE, cartridge: 10 amp 250 v; Bussman 10,25010.		3Z2610.2
XF1701 XF1702	FUSEHOLDER: block type; for two 9/16" dia x 1-1/2" lg Cartridge fuses; Jefferson Elec catalog #388-402.		3Z2831-6.1
XI1701 A, XI1702 A	GLOBE, electric light: glass body; for use w/10-60 w lamp; cylindrical shape; 4-1/2" dia x 6-3/8" h o/a; Collins Rad part/dwg #262 0082 00.	Part of indicator light XI1701. Part of indicator light XI1702.	
S1701 thru S1704	SWITCH, sensitive: 10 amp 125 v a-c, 5 amp 250 v a-c; 2-1/2" lg x 1-21/32" wd x 11/16" h o/a; 3/8" dia roller type actuator; movement differ-	Limit switches for B1701.	3Z9823-15.16

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	ential .003 to .046; momentary action; screw term.; Micro Sw type BZ-RW2; Collins Rad part/dwg #260 0561 00.		
T1701	TRANSFORMER, power: step-up: assembly TF-197/FRT-22; incl 3 wire reversible motor B1701, variable transformer T1701A, brushes for variable transformer as T1701B, and four limit switches S1701, S1702, S1703, S1704; mts on floor; input 230 v, 50-60 cyc 3 ph; output, 3 output wdg, 2575 v rms approx ea ph, 10 amp per ph taps at 90% of each wdg; insulation Class B, test voltage 19 kv; air cooled; dry type; 57" lg x 30" wd x 60" h; Wemco 12-C-4759.	H-v plate.	2Z10002-124

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HOOK-UP WIRE CODE

The characteristics of the hook-up wire shown in the AN/FRT-22 cabling diagrams are represented by groups of symbols. Each symbol group consists of a maximum of three letters followed by a maximum of three numerals. When three letters are used, the first indicates the type of wire, the second represents the size of wire, and the third is the letter "S", used only when the wire is shielded. When two letters are used, the first and second letters indicate either the type and size of wire or the size of wire and shielding. When one letter is used it indicates the wire size only. The first numeral indicates the color of the wire body and the second and third numerals, if any, represent the colors of the tracers, all numerals being in accordance with the standard RMA and JAN-C76 color code.

The symbols are assigned according to the following table.

FIRST LETTER	TYPE OF WIRE
A	AN-J-C-48
B	Busbar round tinned copper
C	JAN type WL (600 volts)
D	Miniature JAN wire (Prodelin)
F	Extra-flexible varnished cambric
G	General Electric Deltabeston
K	Neon sign cable (15,000 volts)
N	Single conductor stranded (not rubber)
P	Single conductor stranded (rubber covered)
S	JAN type SRIR (1000 volts)
V	JAN type SRHV (2500 volts)

SECOND LETTER	AWG# WIRE SIZE
A	22
B	20
C	18
D	16
E	14
F	12
G	10
H	8
J	6
K	4
L	2
M	1
N	0
P	00
Q	000
R	0000

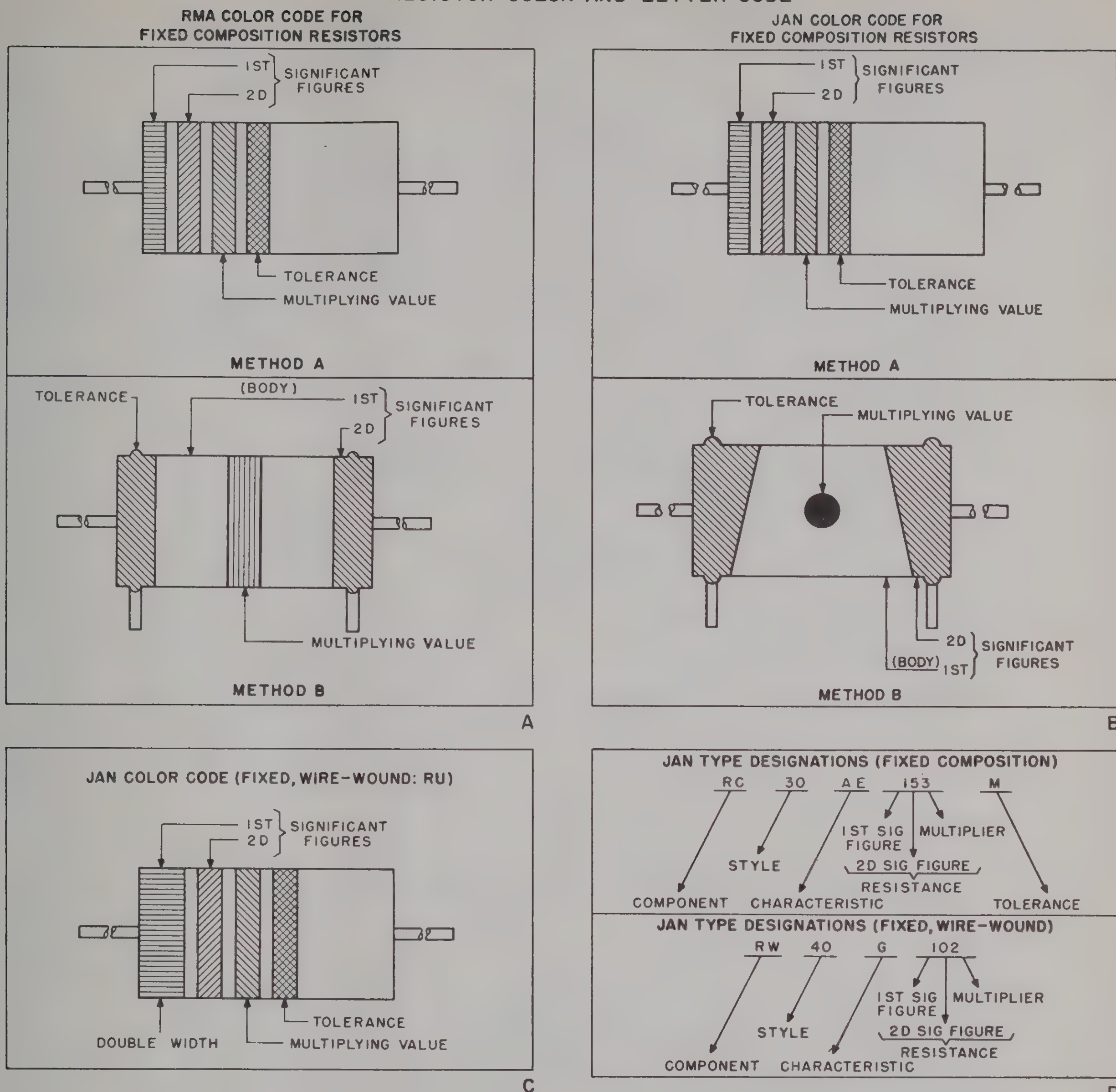
THIRD LETTER	
S	Shielded
None	Unshielded

BODY OR TRACER COLOR	NUMERAL
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9

Some examples are shown on next page.

WIRE DATA	SYMBOL GROUP
Shielded wire, JAN type WL, #22 AWG, White with Red and Green tracers	CAS925
Unshielded wire, busbar round tinned copper, #18 AWG, white with black tracer	BC90
Shielded wire, #18 AWG, black	CSO
Unshielded neon sign cable, #14 AWG, black	KEO
Unshielded wire, #10 AWG, white with black and green tracers	G905

RESISTOR COLOR AND LETTER CODE



STANDARDS				
COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)	JAN LETTER TOLERANCE
BLACK	0	1	—	—
BROWN	1	10	± 1	F
RED	2	100	± 2	G
ORANGE	3	1,000	± 3	—
YELLOW	4	10,000	± 4	—
GREEN	5	100,000	± 5	—
BLUE	6	1,000,000	± 6	—
VIOLET	7	10,000,000	± 7	—
GRAY	8	100,000,000	± 8	—
WHITE	9	1,000,000,000	± 9	—
GOLD	—	0.1	± 5	J
SILVER	—	0.01	± 10	K
NO COLOR	—	—	± 20	M

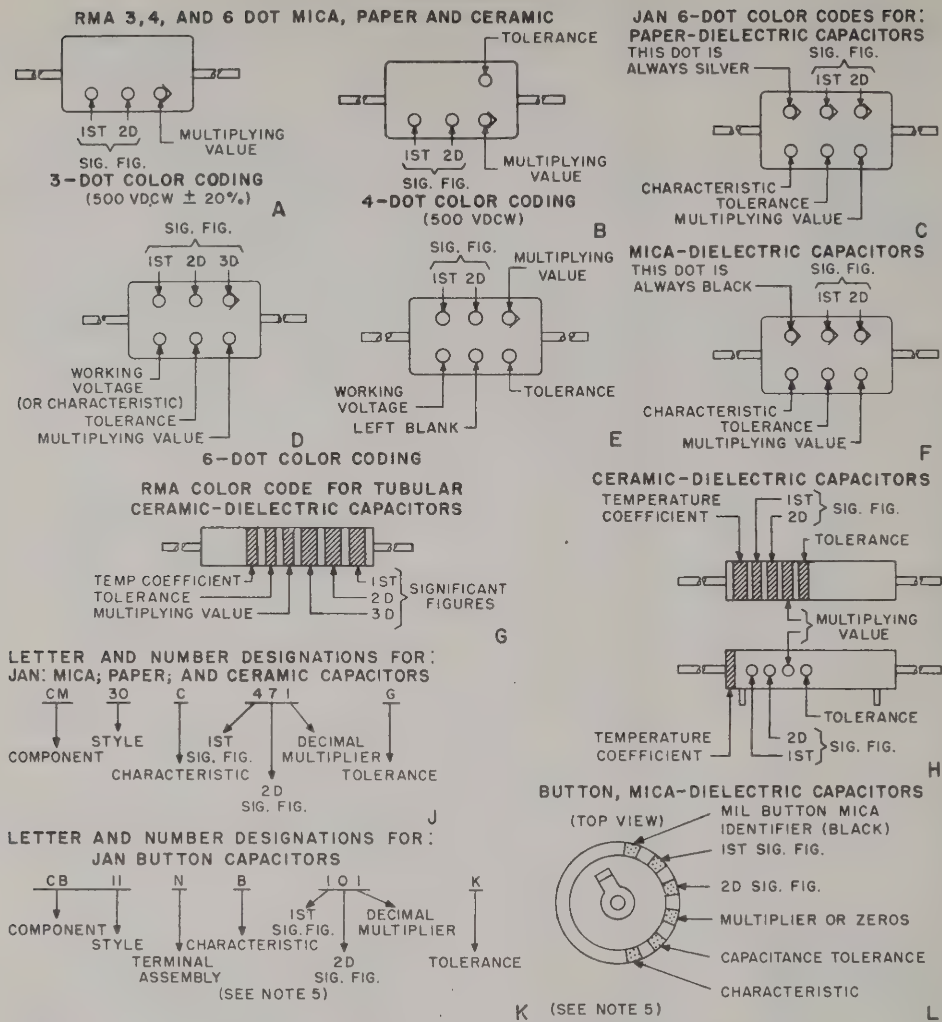
NOTES:

1. RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED.
2. RMA: RADIO MANUFACTURERS ASSOCIATION.
3. JAN: JOINT ARMY-NAVY.
4. THESE COLOR AND NUMBER CODES GIVE ALL RESISTANCE VALUES IN OHMS.
5. RESISTIVE COMPONENTS USED FOR LETTER TOLERANCES ARE: RC, RN, AND RU.
6. WATTAGE FOR RW TYPES IS FOUND IN THE JAN SPECIFICATIONS UNDER CHARACTERISTICS.

TM RC

Figure 232. Resistor Color Code.

CAPACITOR COLOR AND LETTER CODES



- STANDARDS -					JAN MICA-CM		JAN PAPER-CN		JAN CERAMIC-CC					
										CAP.TOL.FOR MORE THAN 10 UUF		CAP.TOL.FOR 10 UUF OR LESS		
COLOR	SIG. FIG.	DECIMAL MULTIPLIER	% TOL.	VDCW	LETTER TOL.	CHARAC-TERISTIC	LETTER TOL.	CHARAC-TERISTIC	DEC. MULT.	%	LETTER DESIG-NATION	UUF	LETTER DESIG-NATION	CHARAC-TERISTIC
BLACK	0	1	±20	500	M	A	M	. A	1	±20	M	±2.0	G	C
BROWN	1	10	± 1	100	-	B	-	E	10	± 1	F	-	-	H
RED	2	100	± 2	200	G	C	-	H	100	± 2	G	-	-	L
ORANGE	3	1,000	± 3	300	-	D	N*	J	1,000	-	-	-	-	P
YELLOW	4	10,000	± 4	400	-	E	-	P	-	-	-	-	-	R
GREEN	5	100,000	± 5	500	-	F	-	R	-	± 5	J	±0.5	D	S
BLUE	6	1,000,000	± 6	600	-	G	-	S	-	-	-	-	-	T
VIOLET	7	10,000,000	± 7	700	-	-	-	T	-	-	-	-	-	U
GRAY	8	100,000,000	± 8	800	-	-	-	-	0.01	-	-	±0.25	C	B
WHITE	9	1,000,000,000	± 9	900	-	-	-	-	0.1	± 10	K	±1.0	F	SL
GOLD	-	0.1	± 5	1,000	J	-	-	-	-	-	-	-	-	A
SILVER	-	0.01	±10	2,000	K	-	K	-	-	-	-	-	-	-
NO COLOR	-	-	±20	500	-	-	-	-	-	-	-	-	-	-
* THE TOLERANCE OF THIS CAPACITOR IS ±30%, NOT ±3%														

NOTES

JAN: JOINT ARMY-NAVY
RMA: RADIO MANUFACTURERS ASSOCIATION

1. THESE COLOR AND LETTER CODES GIVE CAPACITANCES IN MICROMICROFARADS
2. THIS TABLE IS ADAPTED FOR JAN AND RMA COLOR AND JAN LETTER TYPE DESIGNATIONS
3. CERAMIC AND MICA CAPACITORS, BOTH JAN AND RMA, ARE GENERALLY 500 VDCW
4. BUTTON CAPACITORS ARE GENERALLY 300 VDCW
5. READ BUTTON CAPACITOR TOLERANCE UNDER CERAMICS OF MORE THAN 10 UUF
6. CHARACTERISTICS ARE AVAILABLE IN JAN CAPACITOR SPECIFICATION MANUALS
7. THE COMPONENTS USED ABOVE FOR JAN LETTER TYPE DESIGNATIONS ARE:
   CB MICA BUTTON: *CC* CERAMIC: *CM* MICA MOULDED: *CN* PAPER MOULDED

TM CC

Figure 233. Capacitor Color Code.

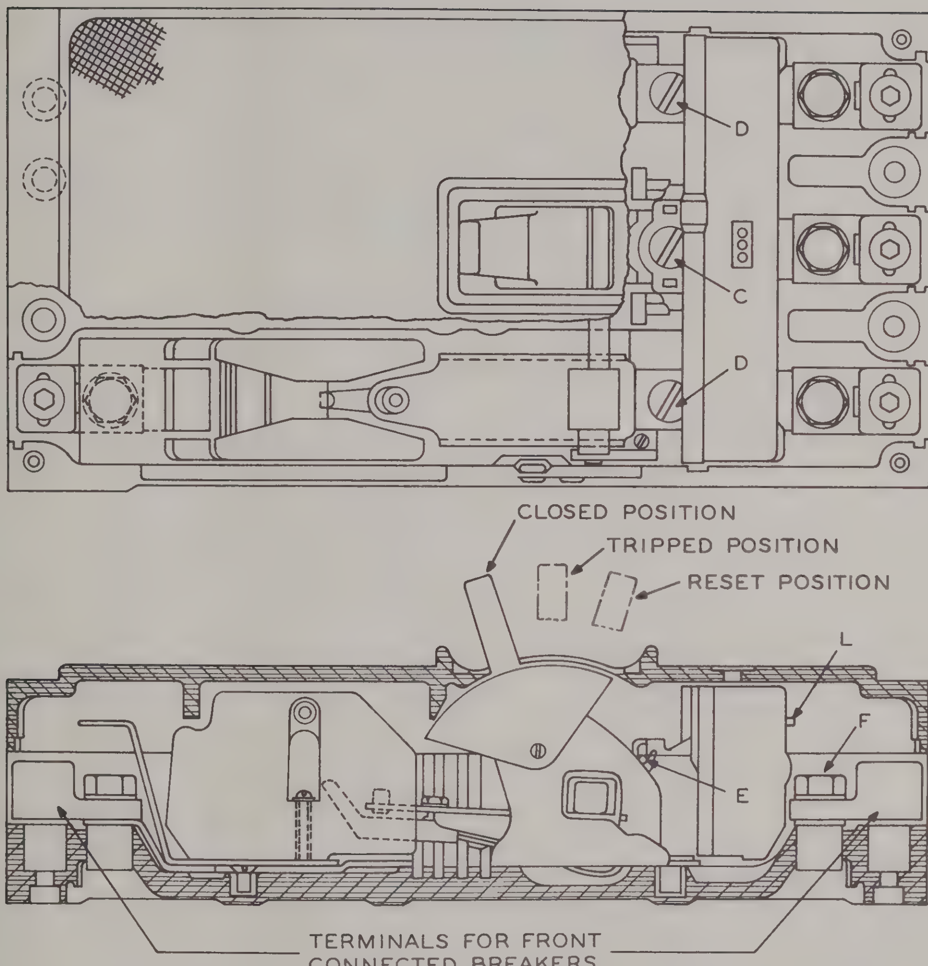
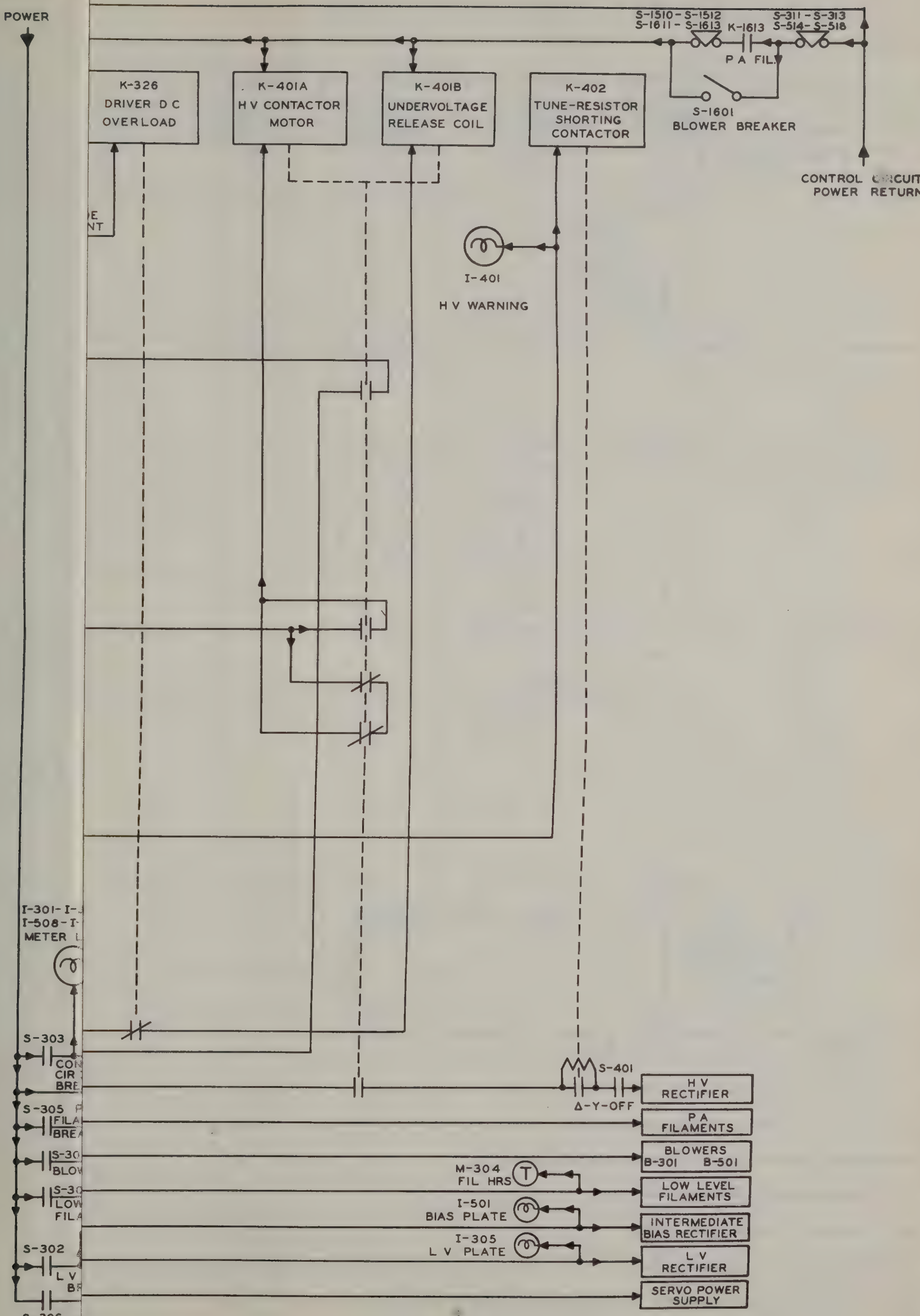


Figure 234. Westinghouse Motor-Operated De-Ion Circuit Breaker, Outline Drawing.


POWER
S-1510 - S-1512
S-1611 - S-1613
K-1613
S-311 - S-313
S-514 - S-518
P A FIL
S-1601
BLOWER BREAKER
CONTROL CIRCUIT
POWER RETURN
K-326
DRIVER D C
OVERLOAD
K-401A
H V CONTACTOR
MOTOR
K-401B
UNDERVOLTAGE
RELEASE COIL
K-402
TUNE-RESISTOR
SHORTING
CONTACTOR
I-401
H V WARNING
I-301- I-
I-508- I-
METER L
S-303
CON
CIR
BRE
S-305
FILA
BREA
S-30
BLOW
S-30
LOW
FILA
S-302
L V
BR
S-306 —
S-401
Δ-Y-OFF
H V
RECTIFIER
P A
FILAMENTS
BLOWERS
B-301 B-501
M-304
FIL HRS
LOW LEVEL
FILAMENTS
I-501
BIAS PLATE
INTERMEDIATE
BIAS RECTIFIER
I-305
L V PLATE
L V
RECTIFIER
SERVO POWER
SUPPLY

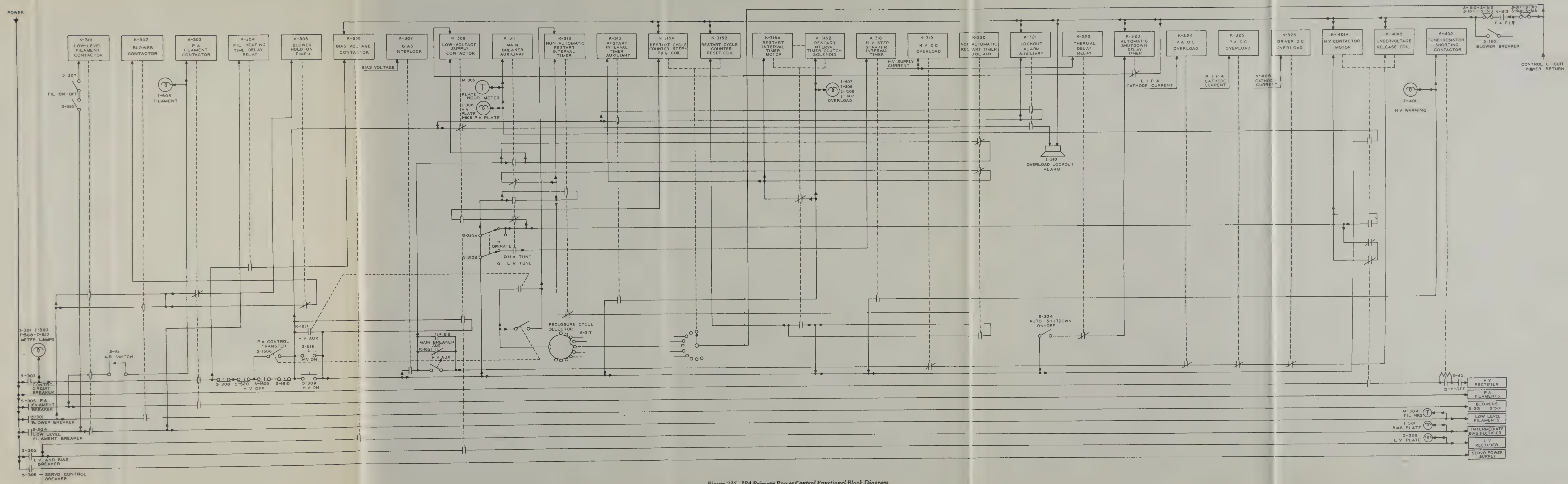
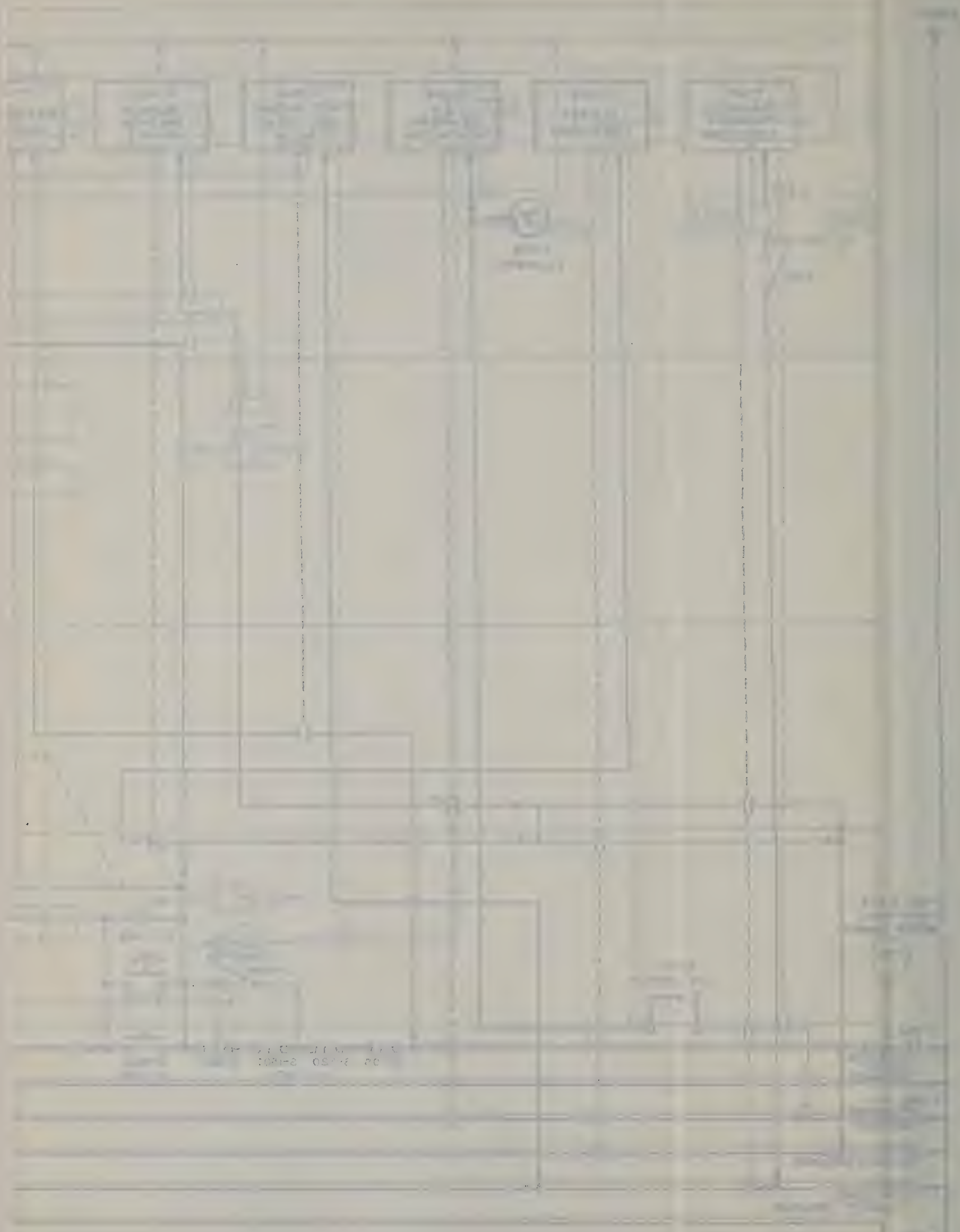
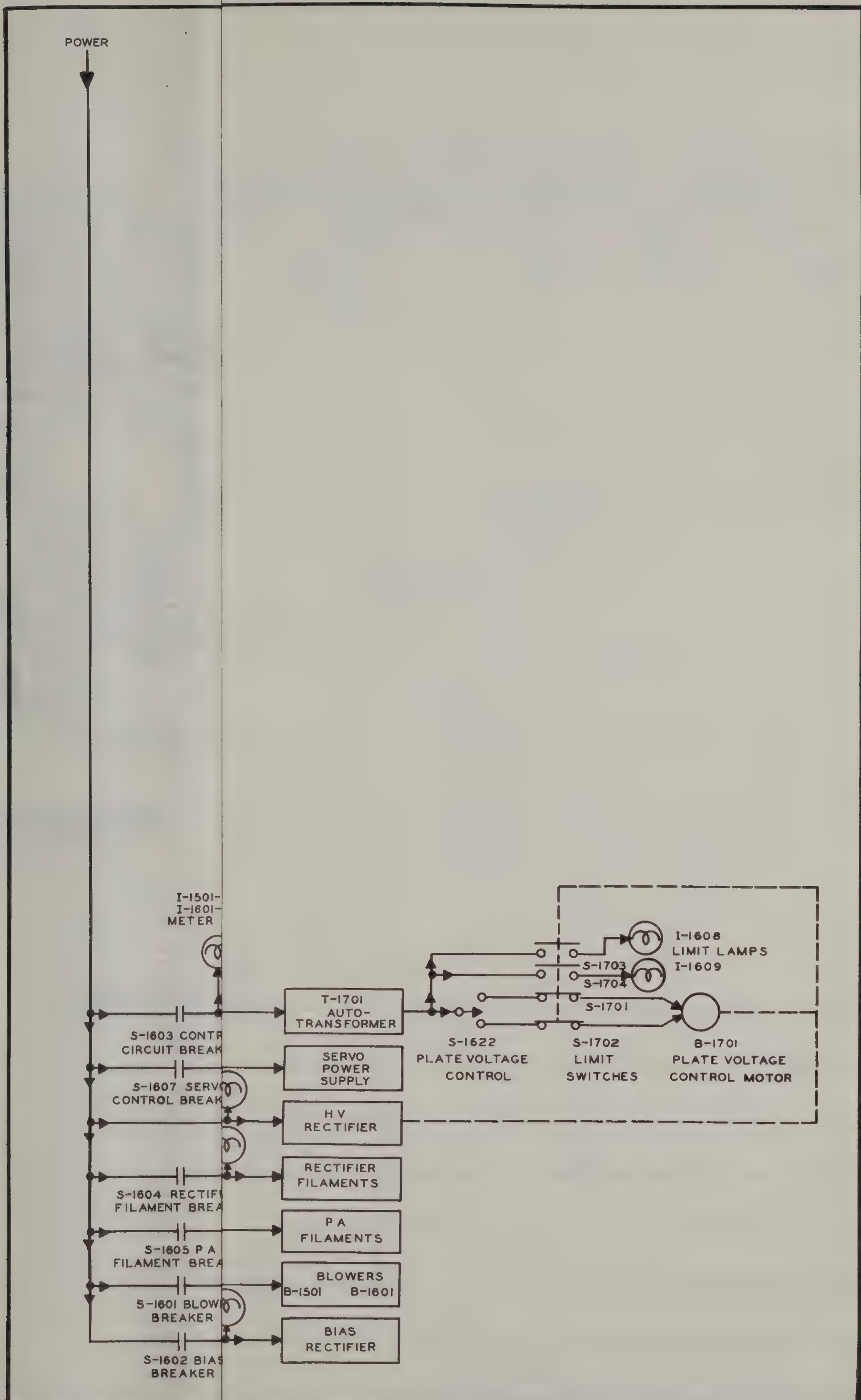
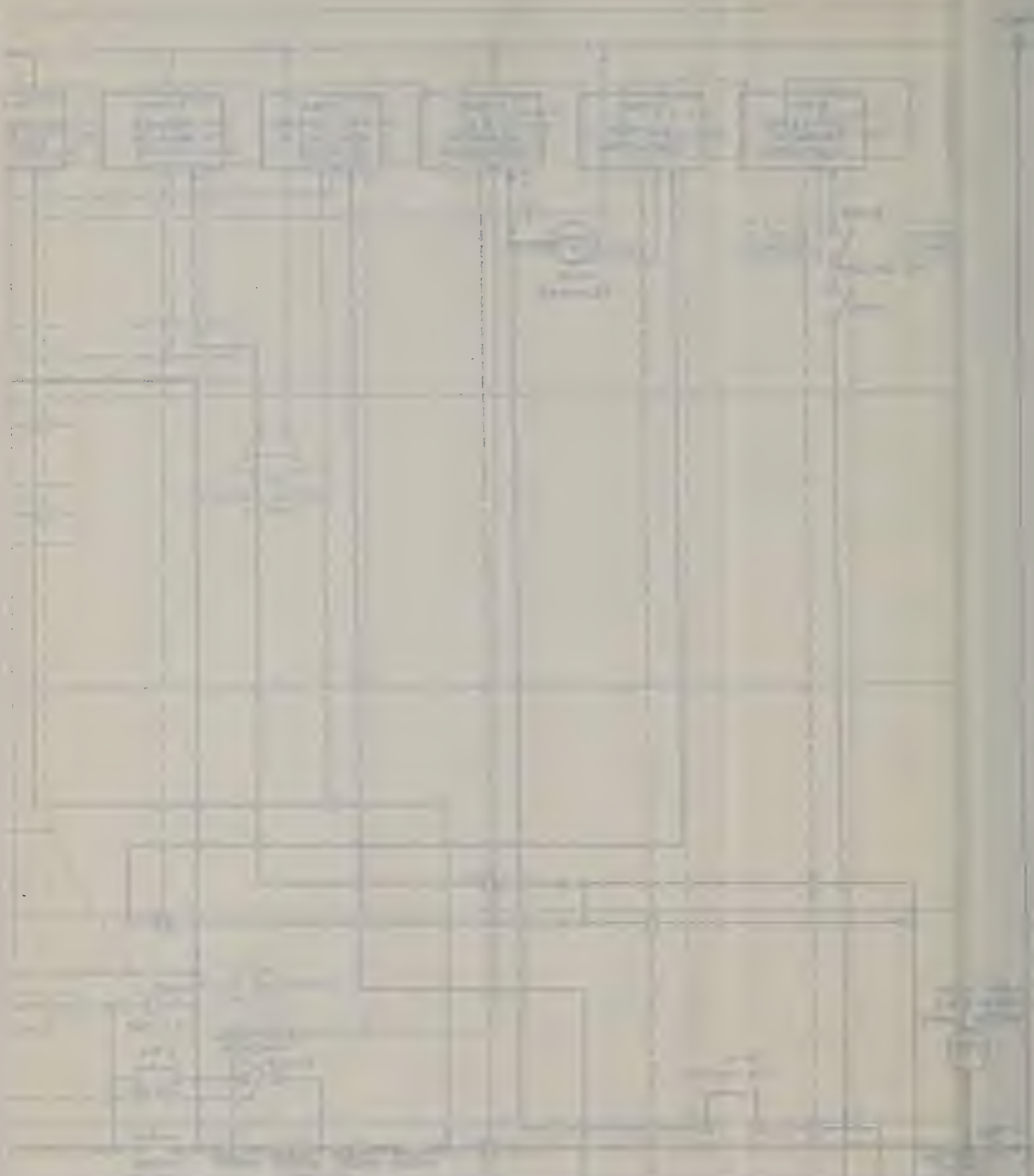


Figure 235. IPA Primary Power Control Functional Block Diagram.




POWER
I-1501-
I-1601-
METER
T-1701
AUTO-
TRANSFORMER
S-1603 CONTR
CIRCUIT BREAK
SERVO
POWER
SUPPLY
S-1607 SERV
CONTROL BREAK
H V
RECTIFIER
RECTIFIER
FILAMENTS
S-1604 RECTIFI
FILAMENT BREA
P A
FILAMENTS
S-1605 P A
FILAMENT BREA
BLOWERS
B-1501 B-1601
S-1601 BLOW
BREAKER
BIAS
RECTIFIER
S-1602 BIAS
BREAKER
I-1608
LIMIT LAMPS
I-1609
S-1703
S-1704
S-1701
S-1622
PLATE VOLTAGE
CONTROL
S-1702
LIMIT
SWITCHES
B-1701
PLATE VOLTAGE
CONTROL MOTOR



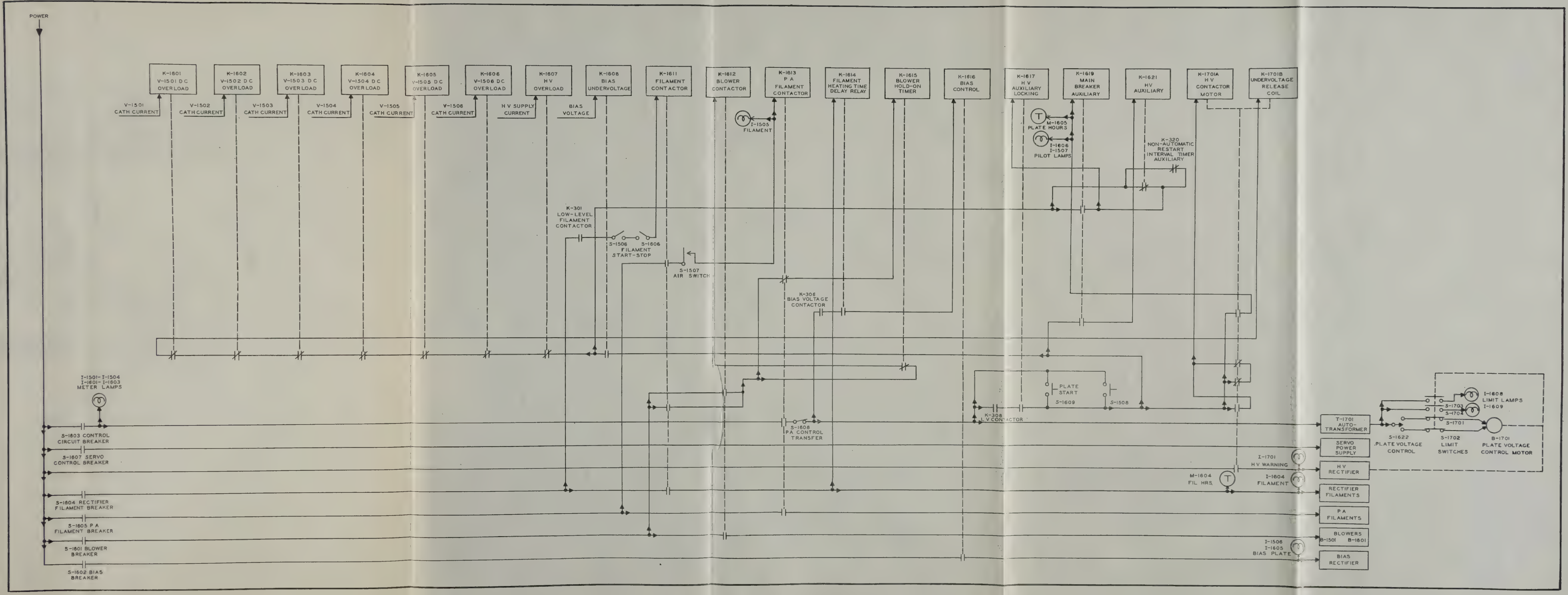
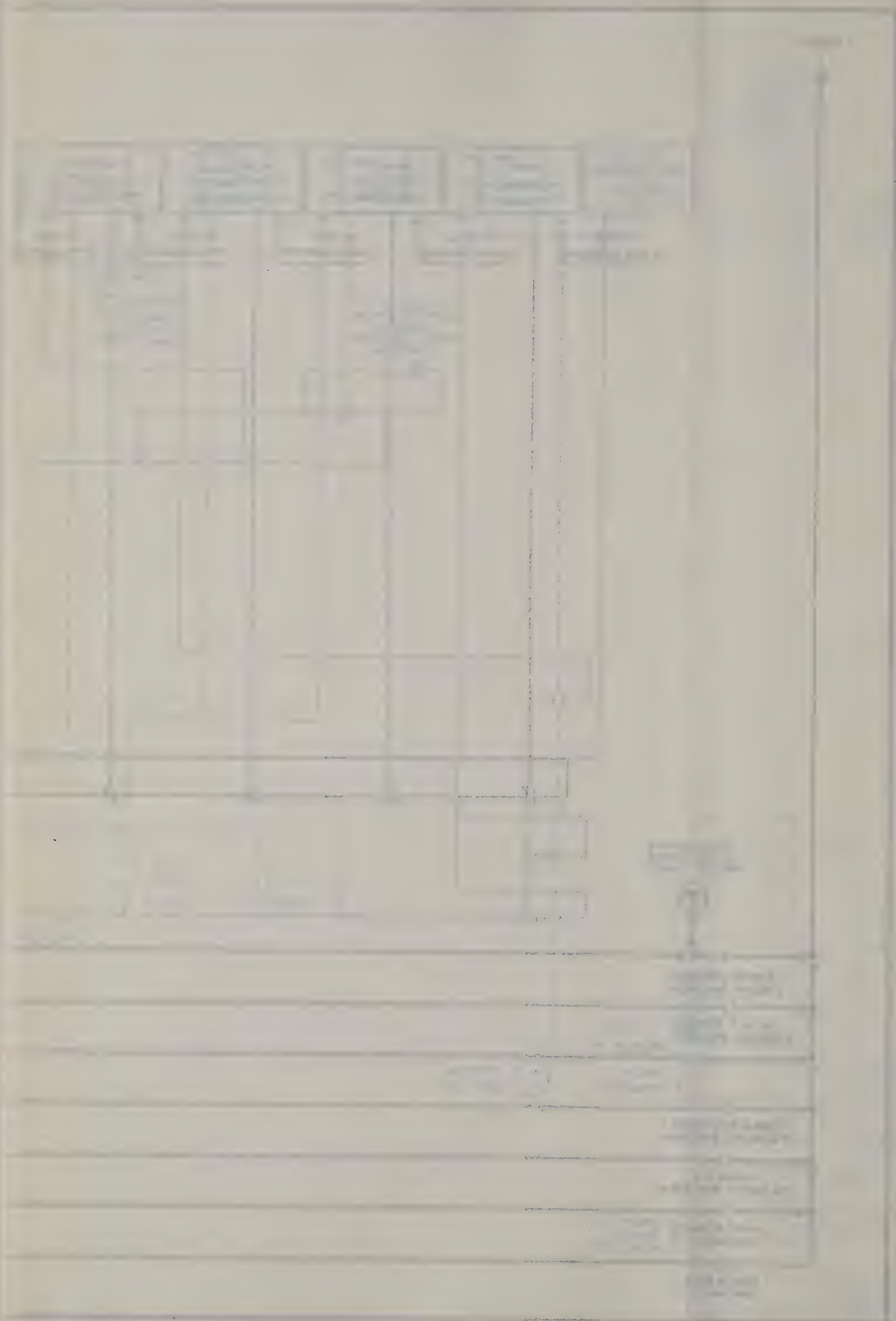
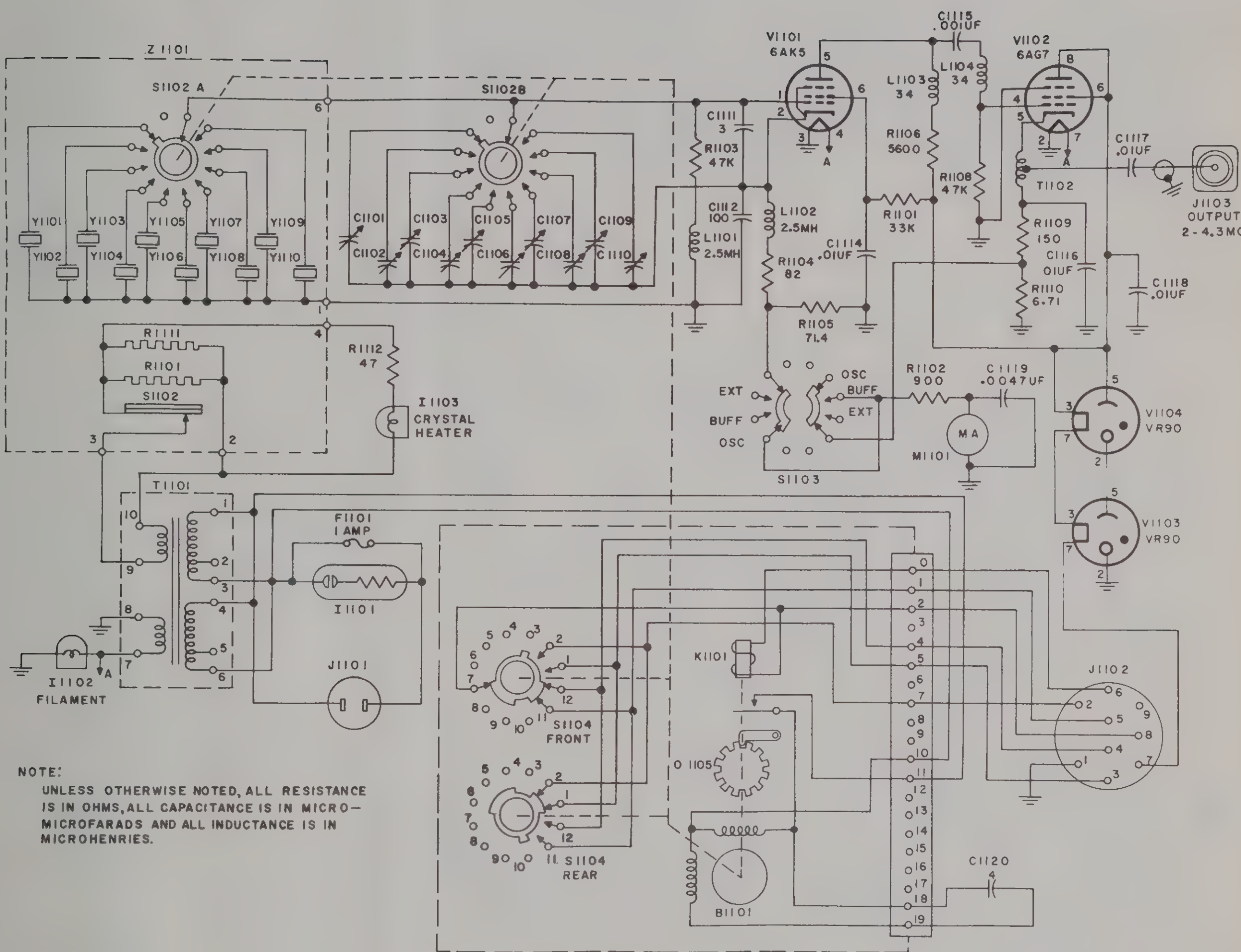


Figure 236. PA Primary Power Control Functional Block Diagram.

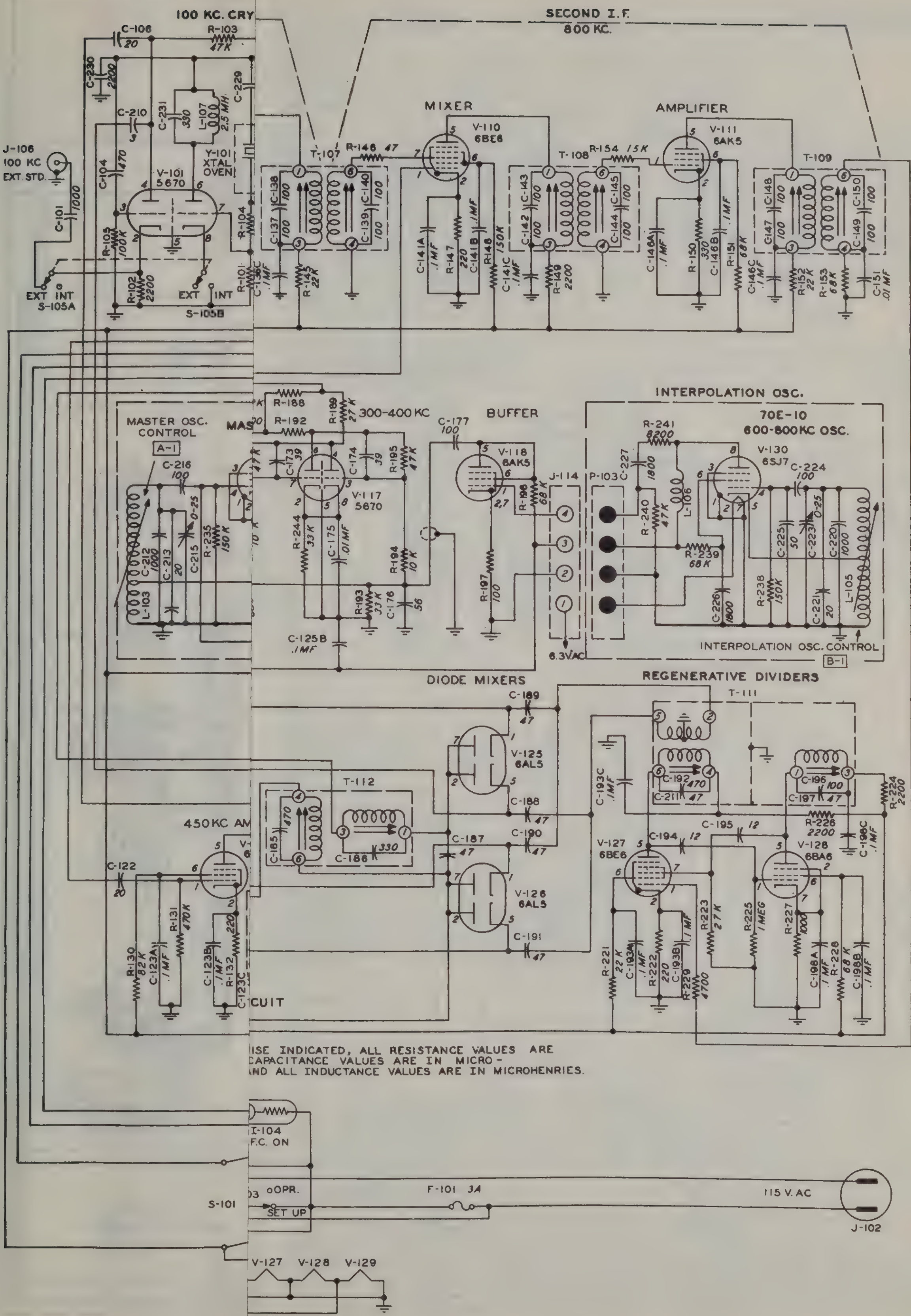




NOTE:

UNLESS OTHERWISE NOTED, ALL RESISTANCE IS IN OHMS, ALL CAPACITANCE IS IN MICRO-MICROFARADS AND ALL INDUCTANCE IS IN MICROHENRIES.

Figure 237. R-F Oscillator O-270/FRT-26, Complete Schematic Diagram.



100 KC. CRY
SECOND I.F.
800 KC.
MIXER
AMPLIFIER
J-106
100 KC
EXT. STD.
V-101
5670
Y-101
XTAL
OVEN
L-107
2.5 MH.
T-107
R-148 47
V-110
6BE6
T-108
R-154 15K
V-111
6AK5
T-109
EXT INT
S-105A
S-105B
INTERPOLATION OSC.
MASTER OSC.
CONTROL
A-1
300-400 KC
BUFFER
V-117
5670
V-118
6AK5
J-114
P-103
70E-10
600-800 KC OSC.
V-130
6SJ7
L-103
L-105
L-106
6.3V AC
INTERPOLATION OSC. CONTROL
B-1
DIODE MIXERS
REGENERATIVE DIVIDERS
T-111
V-125
6AL5
T-112
450 KC AM
V-126
6AL5
V-127
6BE6
V-128
6BA6
CUIT
ISE INDICATED, ALL RESISTANCE VALUES ARE
CAPACITANCE VALUES ARE IN MICRO-
AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.
I-104
F.C. ON
OPR.
SET UP
S-101
F-101 3A
115 V. AC
J-102
V-127 V-128 V-129

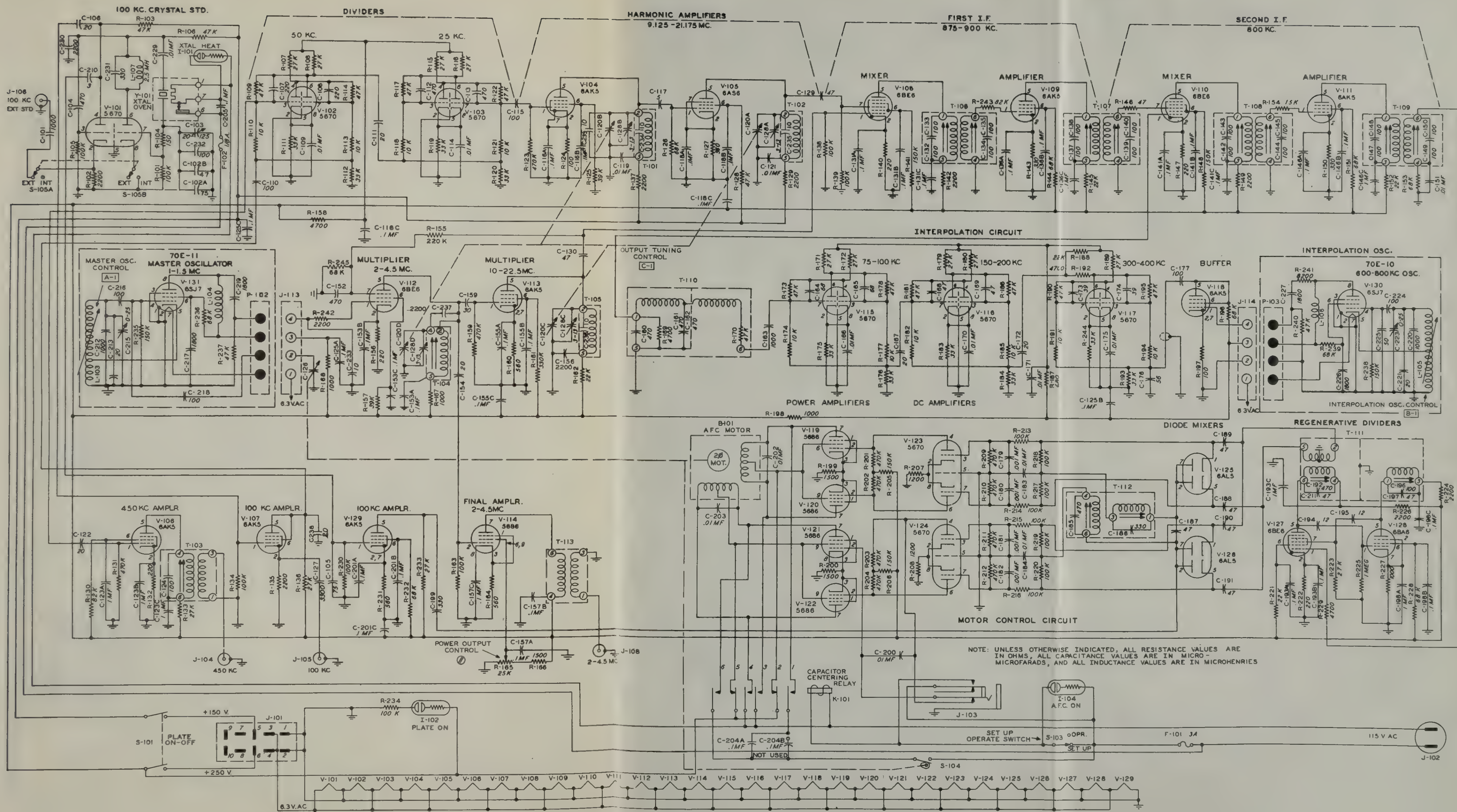
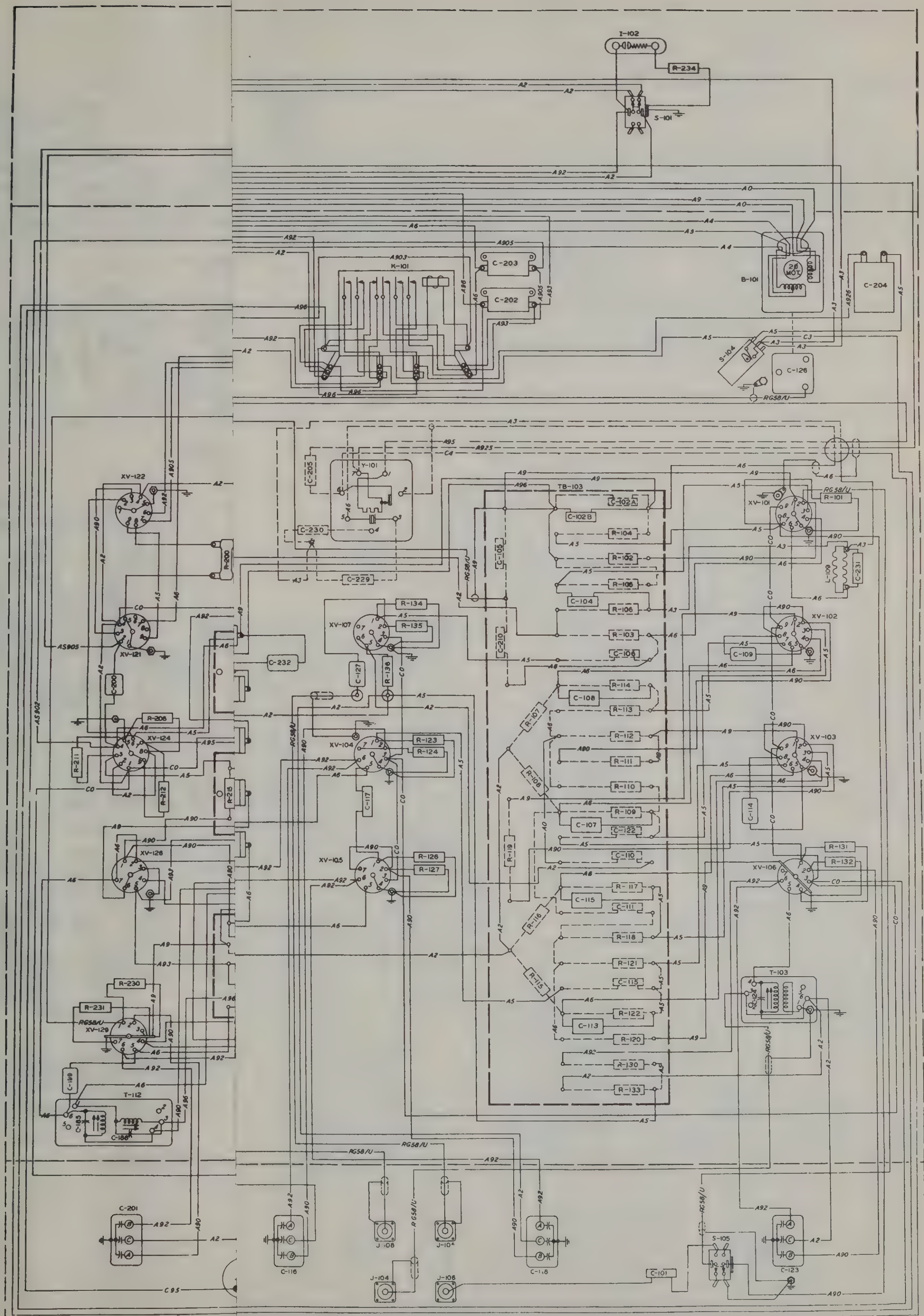
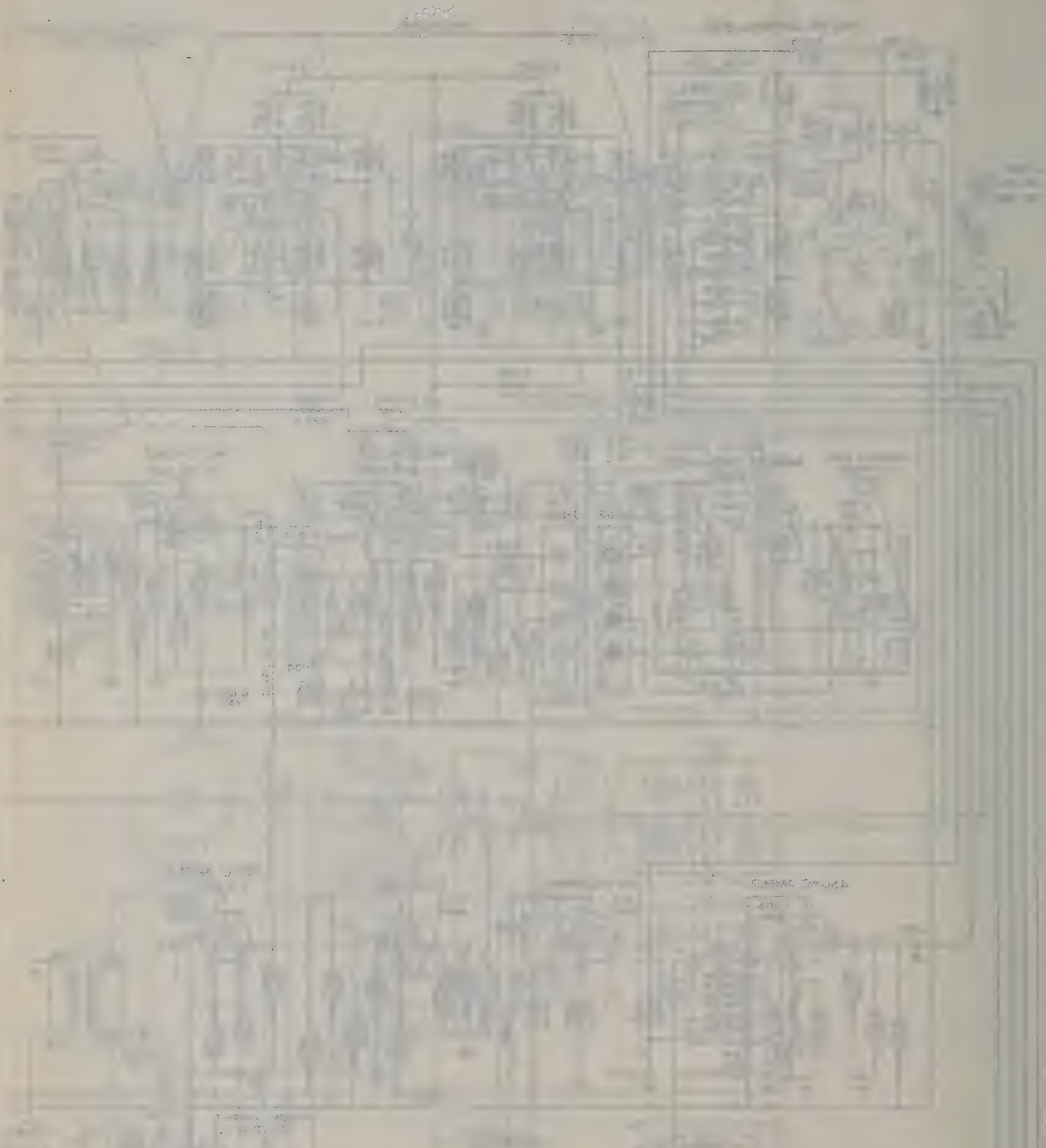


Figure 238. R-F Oscillator O-91/FRT-5, Complete Schematic Diagram.


I-102
R-234
S-101
K-101
C-203
C-202
B-101
C-204
S-104
C-126
Y-101
C-205
C-230
C-229
TB-103
C-102A
C-102B
R-104
R-102
R-105
C-104
R-106
R-103
C-106
XV-122
R-200
XV-121
C-200
XV-124
R-208
R-211
R-212
R-215
C-232
XV-107
R-134
R-135
C-127
R-136
XV-104
R-123
R-124
C-117
XV-105
R-126
R-127
XV-126
XV-129
R-230
R-231
T-112
C-186
XV-101
R-101
L-109
C-231
XV-102
C-109
R-114
C-108
R-113
R-107
R-112
R-111
R-108
R-110
R-109
C-107
C-122
R-119
C-110
R-117
C-115
R-116
R-118
R-121
R-115
C-113
R-122
R-120
R-130
R-133
XV-103
C-114
XV-106
R-131
R-132
T-103
C-201
C-116
J-108
J-104
J-106
C-101
S-105
C-123
RG58/U



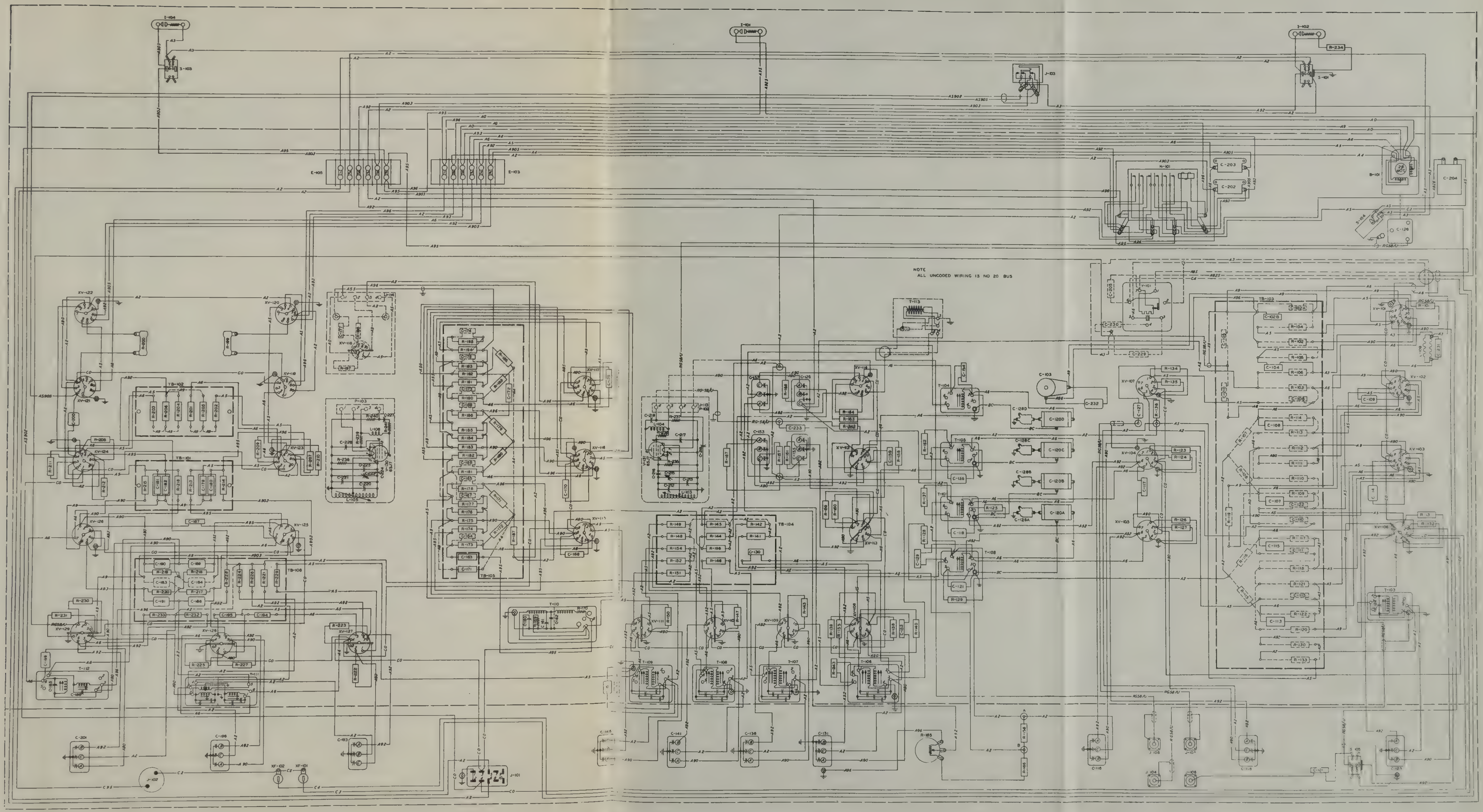
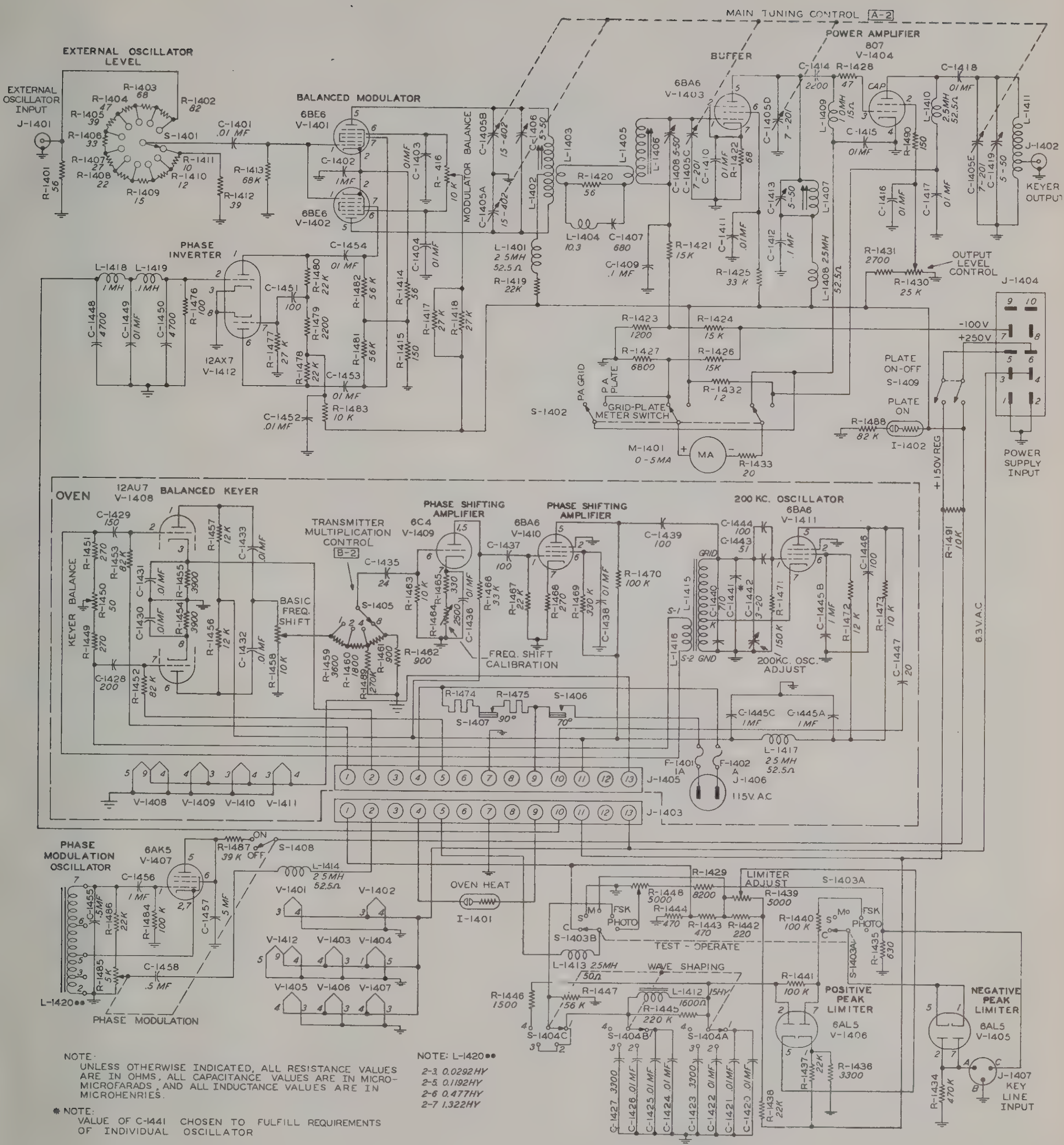


Figure 239. R-F Oscillator O-91/FRT-5, Wiring Diagram.

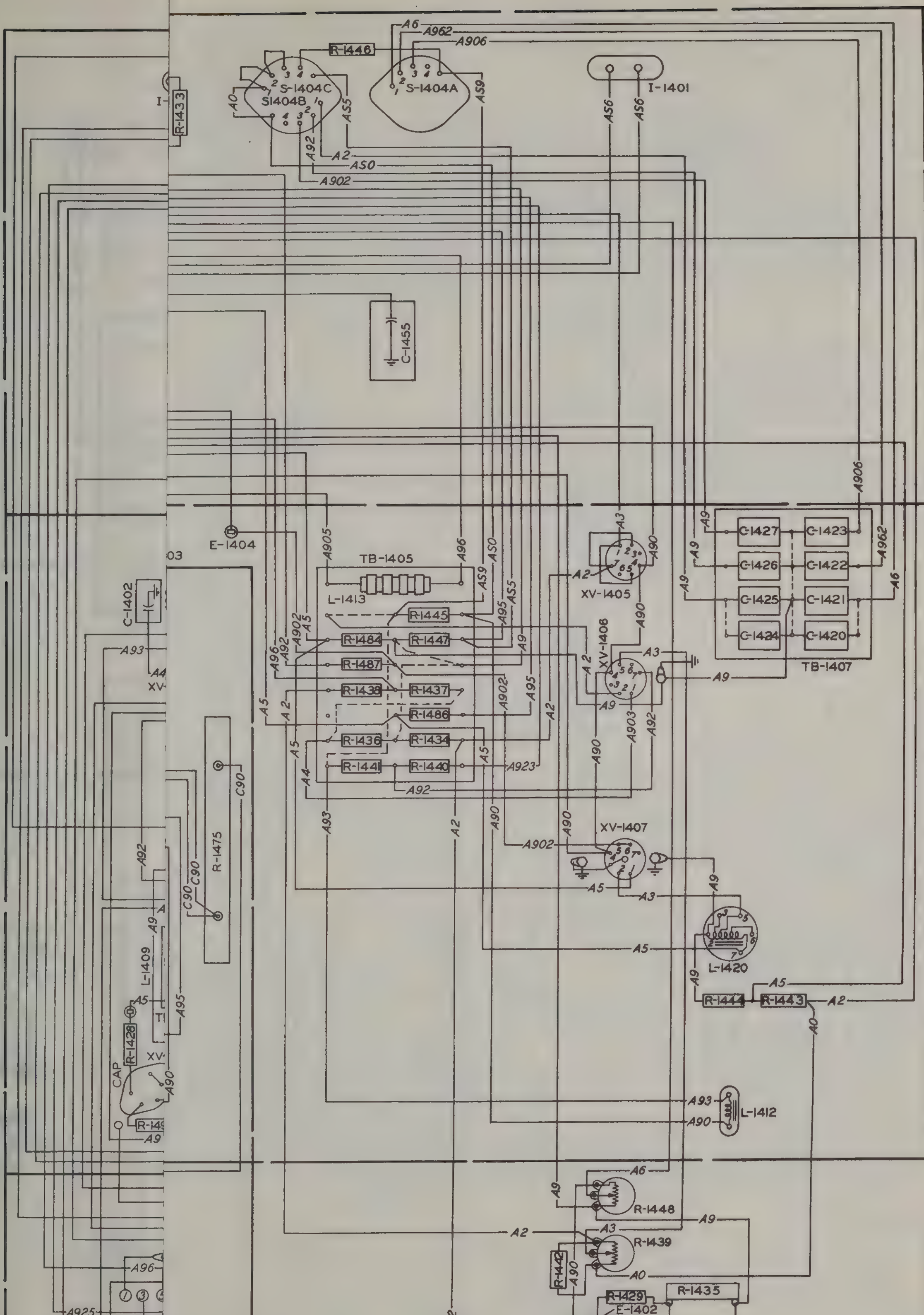


NOTE:
UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICRO-MICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

* NOTE:
VALUE OF C-1441 CHOSEN TO FULFILL REQUIREMENTS OF INDIVIDUAL OSCILLATOR

NOTE: L-1420••
2-3 0.0292HY
2-5 0.1192HY
2-6 0.477HY
2-7 1.322HY

Figure 240. Frequency-Shift Keyer KY-45/FRT-5, Complete Schematic Diagram.


R-1446
S-1404C
S1404B
S-1404A
I-1401
R-1433
C-1455
E-1404
TB-1405
L-1413
R-1445
R-1484
R-1447
R-1487
R-1438
R-1437
R-1486
R-1436
R-1434
R-1441
R-1440
XV-1405
XV-1406
XV-1407
C-1427
C-1423
C-1426
C-1422
C-1425
C-1421
C-1424
C-1420
TB-1407
L-1420
R-1444
R-1443
L-1412
R-1448
R-1439
R-1442
R-1429
R-1435
E-1402
J-1407
C-1402
R-1475
L-1409
R-1428
CAP

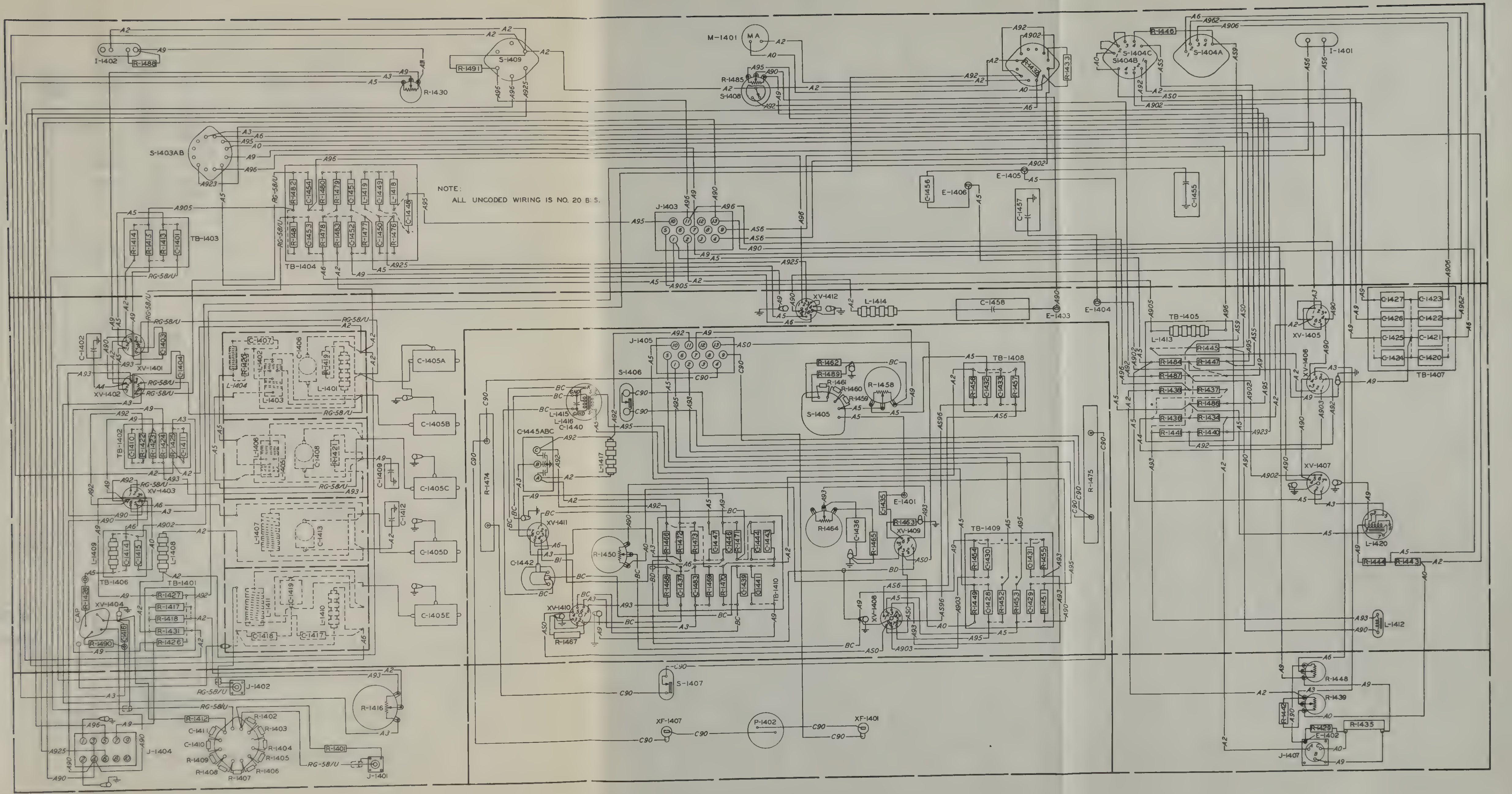


Figure 241. Frequency-Shift Keyer KY-45/FRT-5, Wiring Diagram.

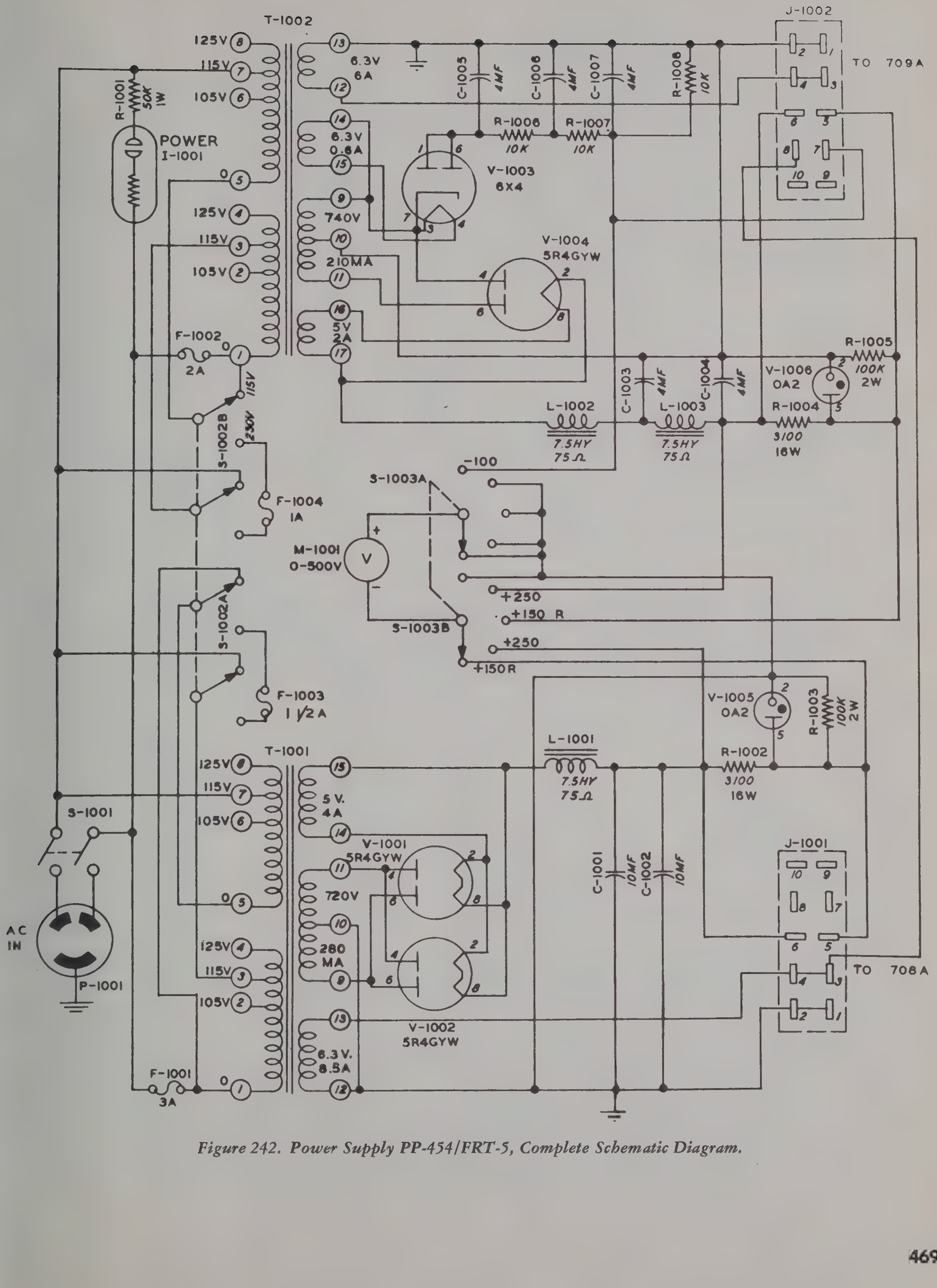


Figure 242. Power Supply PP-454/FRT-5, Complete Schematic Diagram.

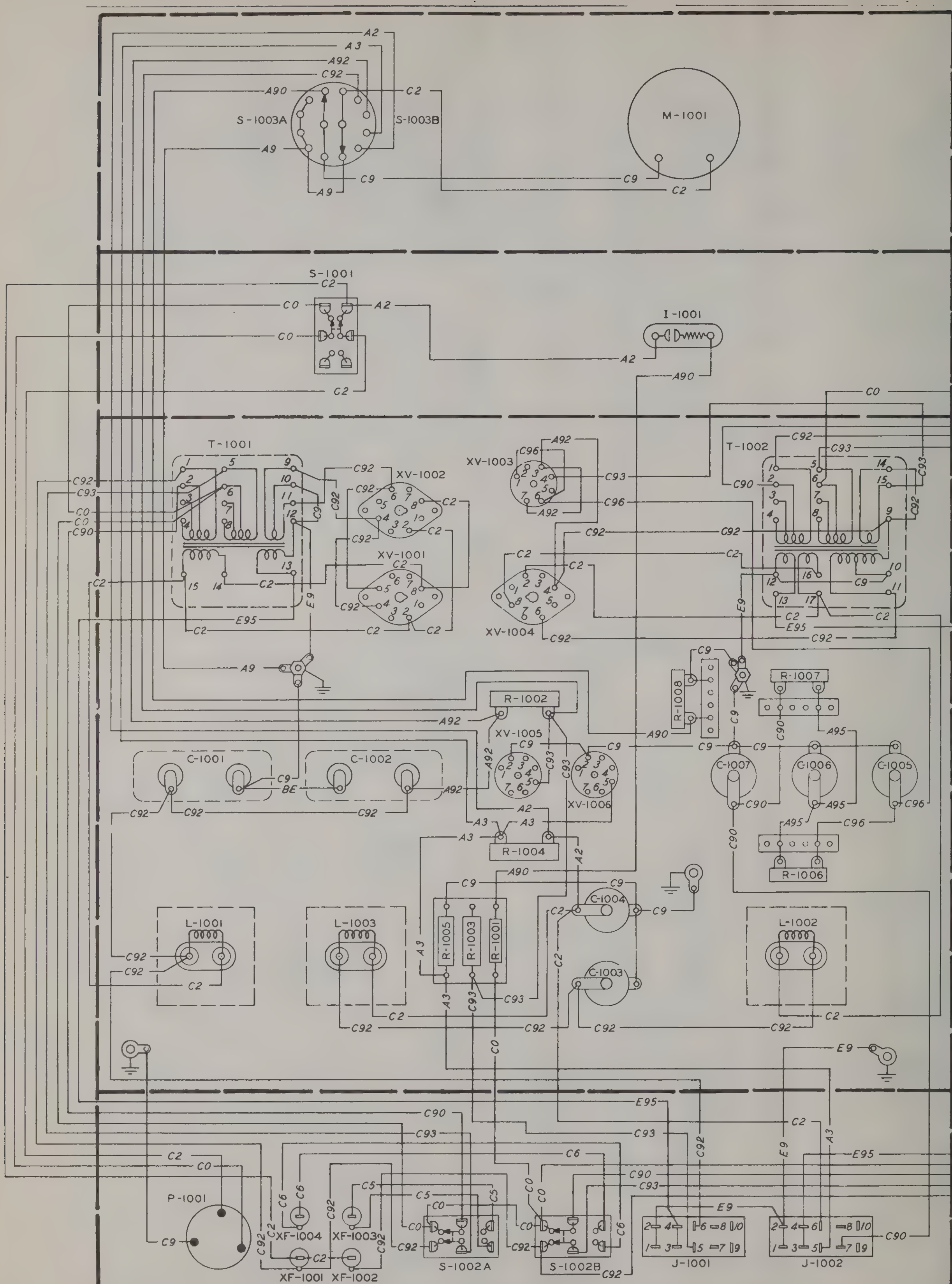


Figure 243. Power Supply PP-454/FRT-5, Wiring Diagram.

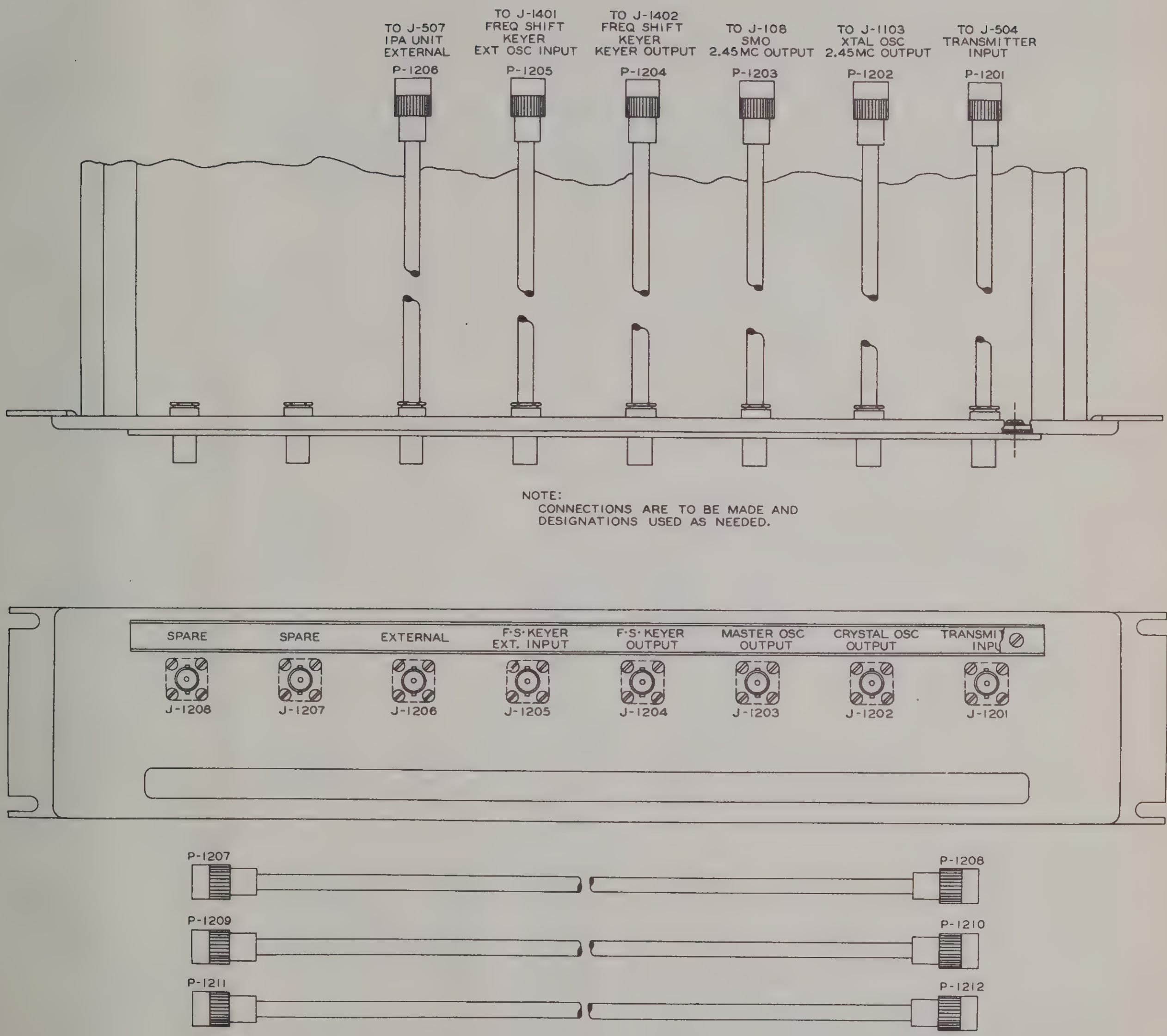
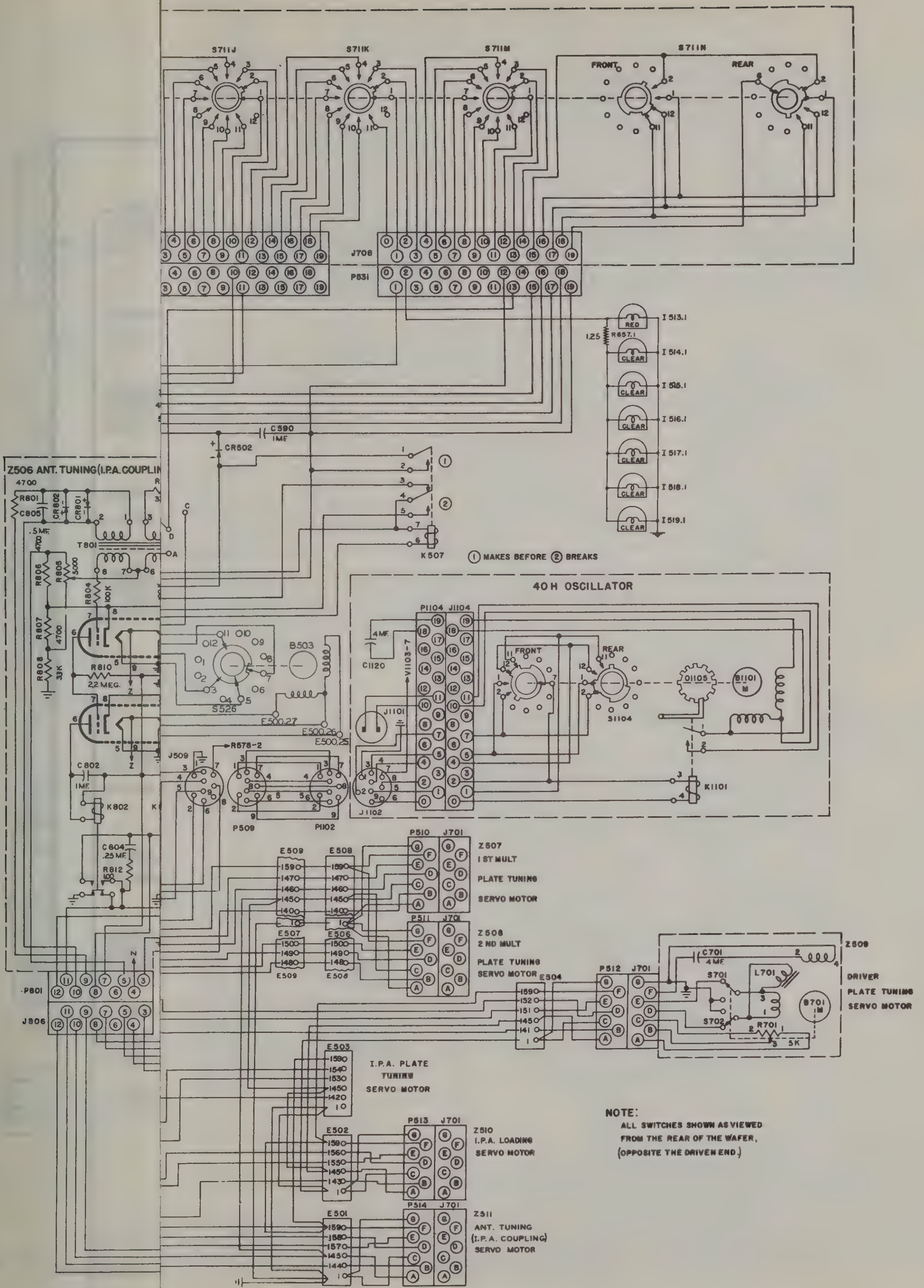


Figure 244. Radio Transmitter T-454/FRT-26, Patch Panel, Outline Drawing.


S711J
S711K
S711M
S711N
FRONT
REAR
J706
P531
RED
CLEAR
I 513.1
I 514.1
I 515.1
I 516.1
I 517.1
I 518.1
I 519.1
R657.1
C590
1MF
CR502
K507
(1) MAKES BEFORE (2) BREAKS
Z506 ANT. TUNING(I.P.A. COUPLIN
R801
C805
CR802
CR801
T801
R806
R805
R804
R807
R808
R810
2.2 MEG.
C802
K802
C604
.25 MF.
R812
P801
J806
S526
B503
E500.27
E500.26
E500.25
40 H OSCILLATOR
P1104
J1104
C1120
V1103-7
J1101
J1102
S1104
O1105
B1101
K1101
J509
R578-2
P509
P1102
E509
E508
E507
E506
P510
J701
P511
Z507
1 ST MULT
PLATE TUNING
SERVO MOTOR
Z508
2 ND MULT
PLATE TUNING
SERVO MOTOR
E504
P512
Z509
C701
S701
L701
S702
R701
B701
DRIVER
PLATE TUNING
SERVO MOTOR
E503
I.P.A. PLATE
TUNING
SERVO MOTOR
E502
P513
Z510
I.P.A. LOADING
SERVO MOTOR
E501
P514
Z511
ANT. TUNING
(I.P.A. COUPLING)
SERVO MOTOR
NOTE:
ALL SWITCHES SHOWN AS VIEWED
FROM THE REAR OF THE WAFER,
(OPPOSITE THE DRIVEN END.)

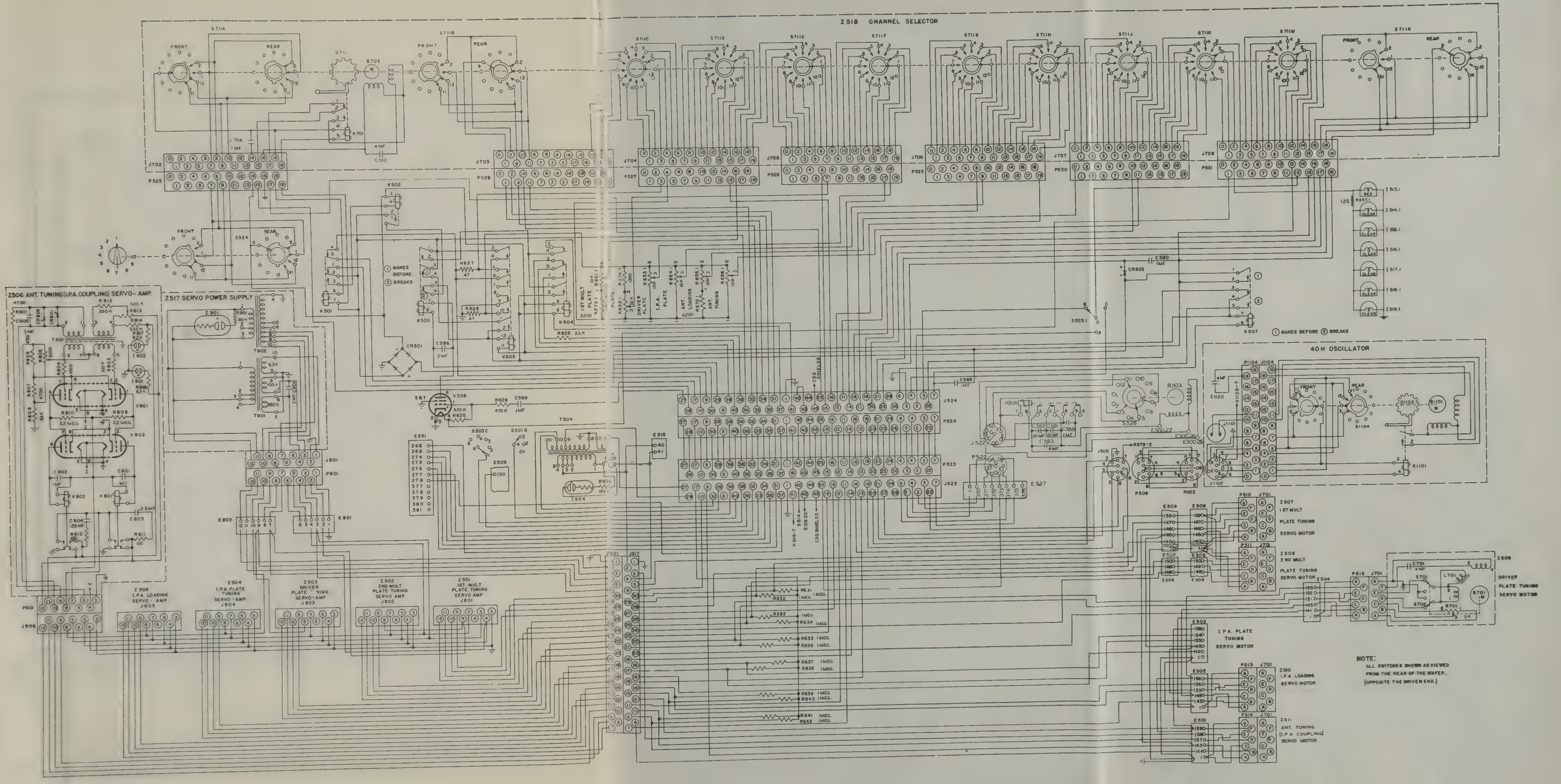
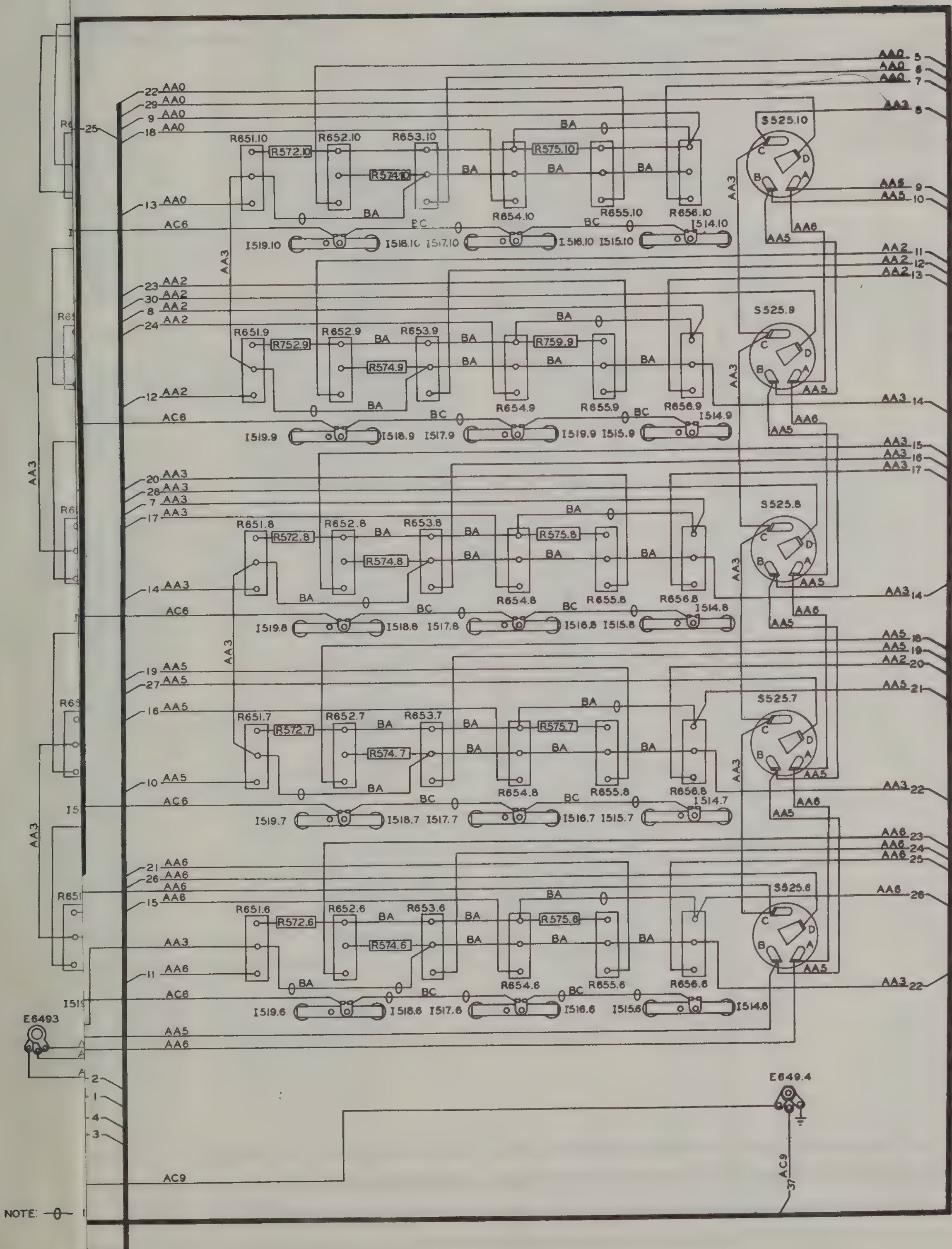


Figure 245. Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Complete Schematic Diagram.



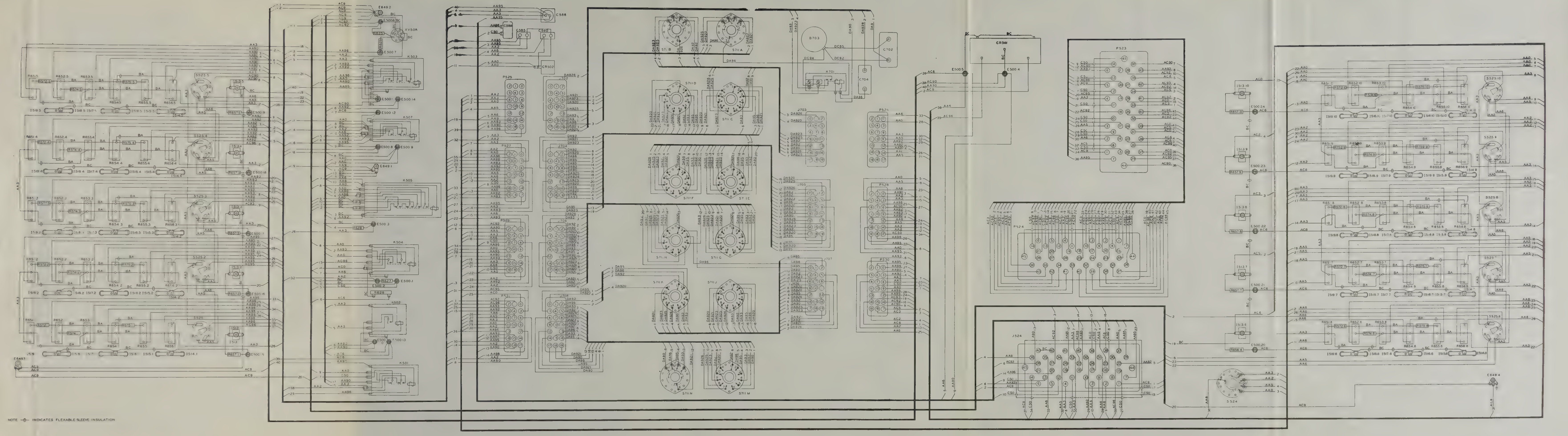
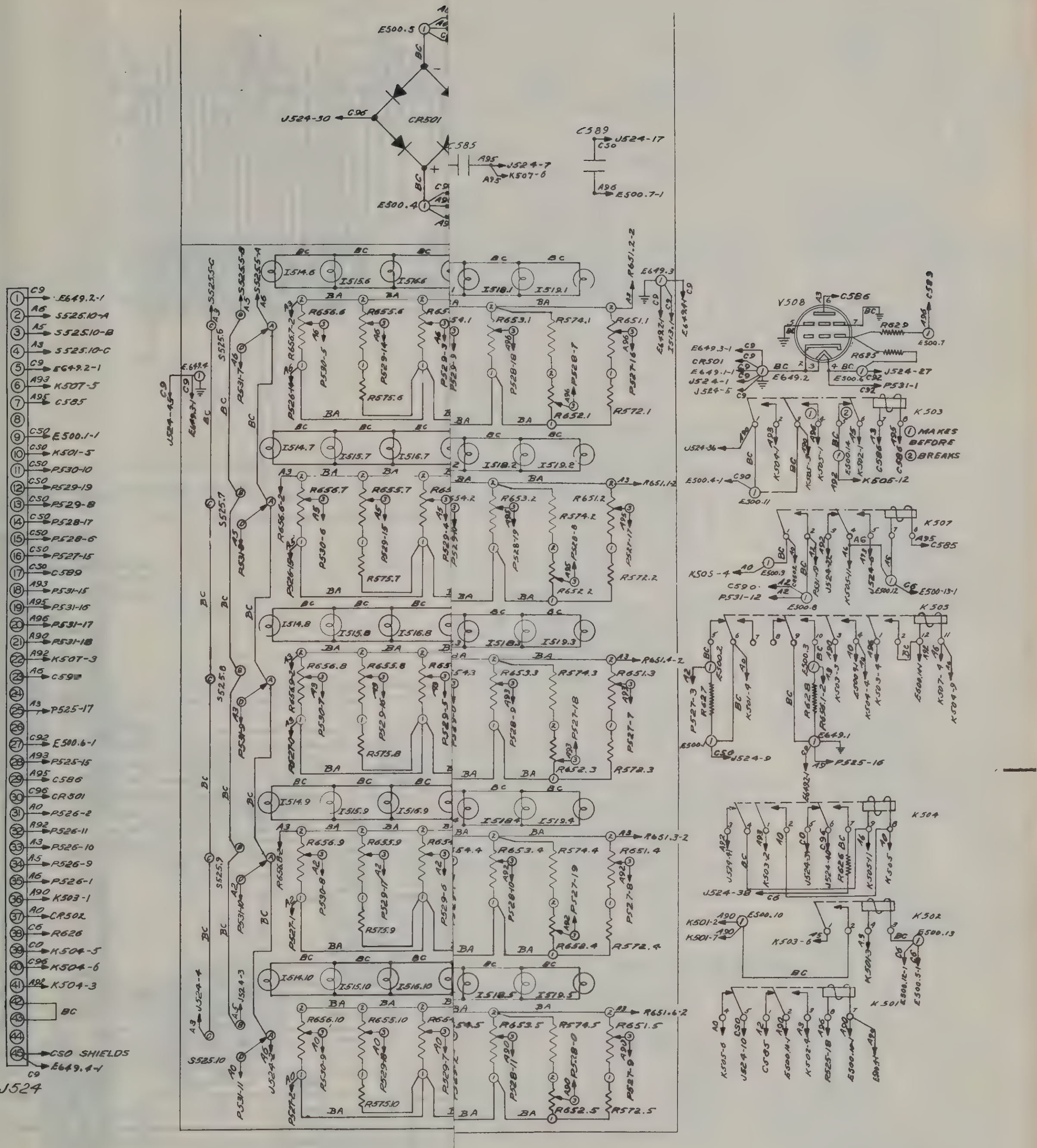
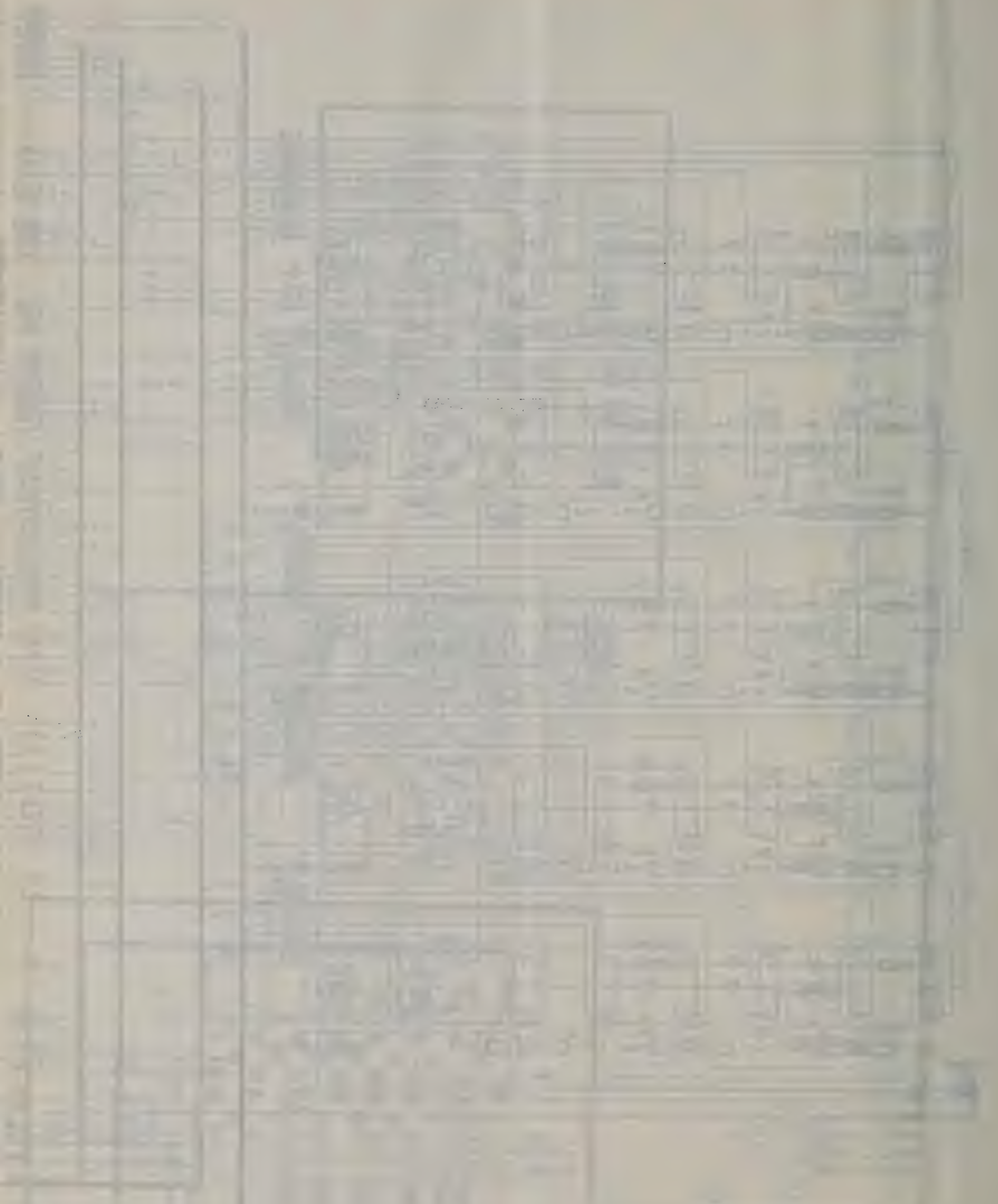


Figure 246. Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, ***Wiring Diagram.***


J524
E649.2-1
S525.10-A
S525.10-B
S525.10-C
E649.2-1
K507-5
C585
E500.1-1
K501-5
P530-10
P529-19
P529-8
P528-17
P528-6
P527-15
C589
P531-15
P531-16
P531-17
P531-18
K507-3
P525-17
E500.6-1
P525-15
C586
CR501
P526-2
P526-11
P525-10
P526-9
P526-1
K503-1
CR502
R626
K504-5
K504-6
K504-3
BC
CSO SHIELDS
E649.4-1
CR501
C585
C589
E500.5
E500.4
V508
K503
K507
K505
K504
K502
K501
① MAKES BEFORE
② BREAKS



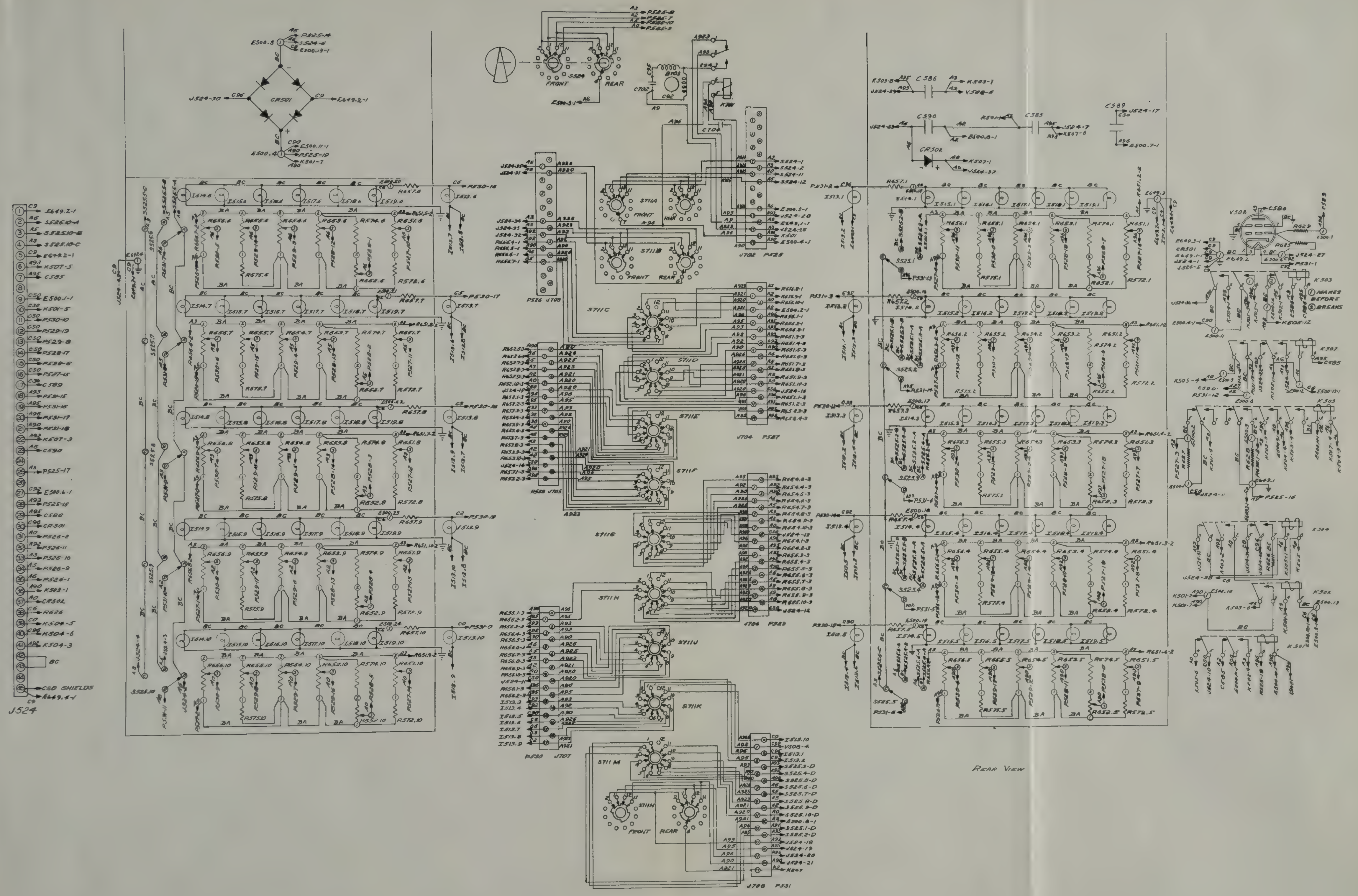
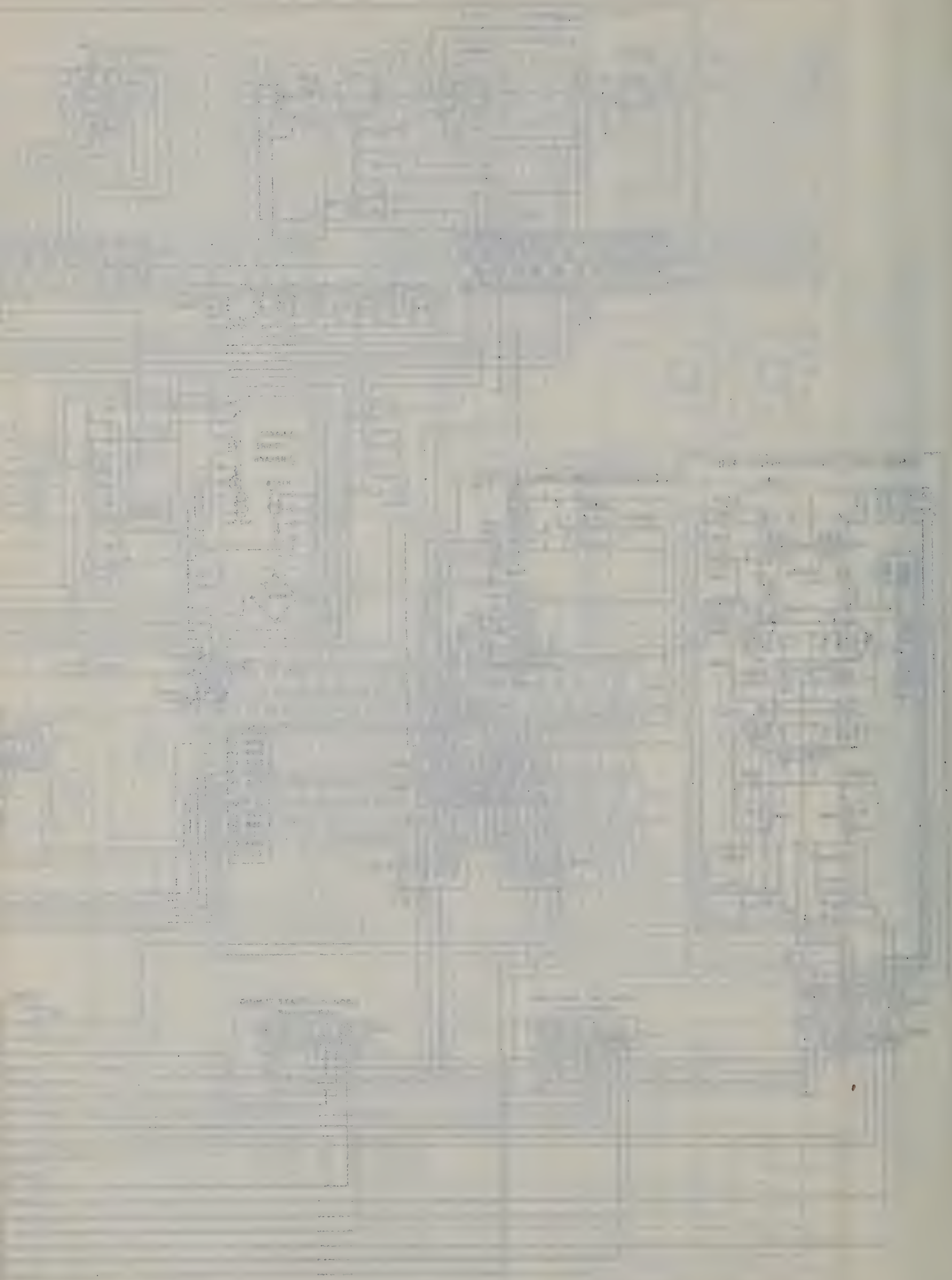
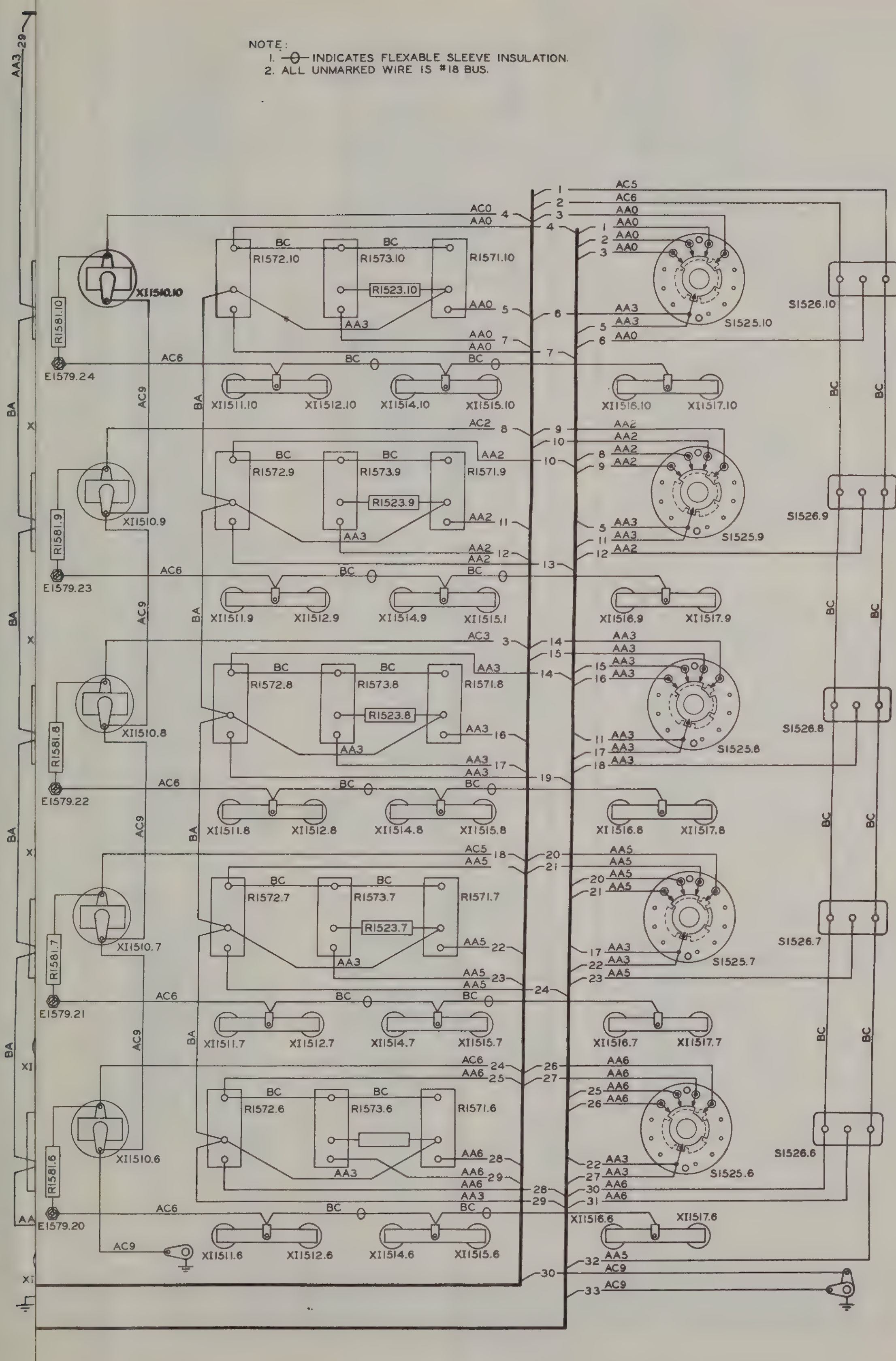
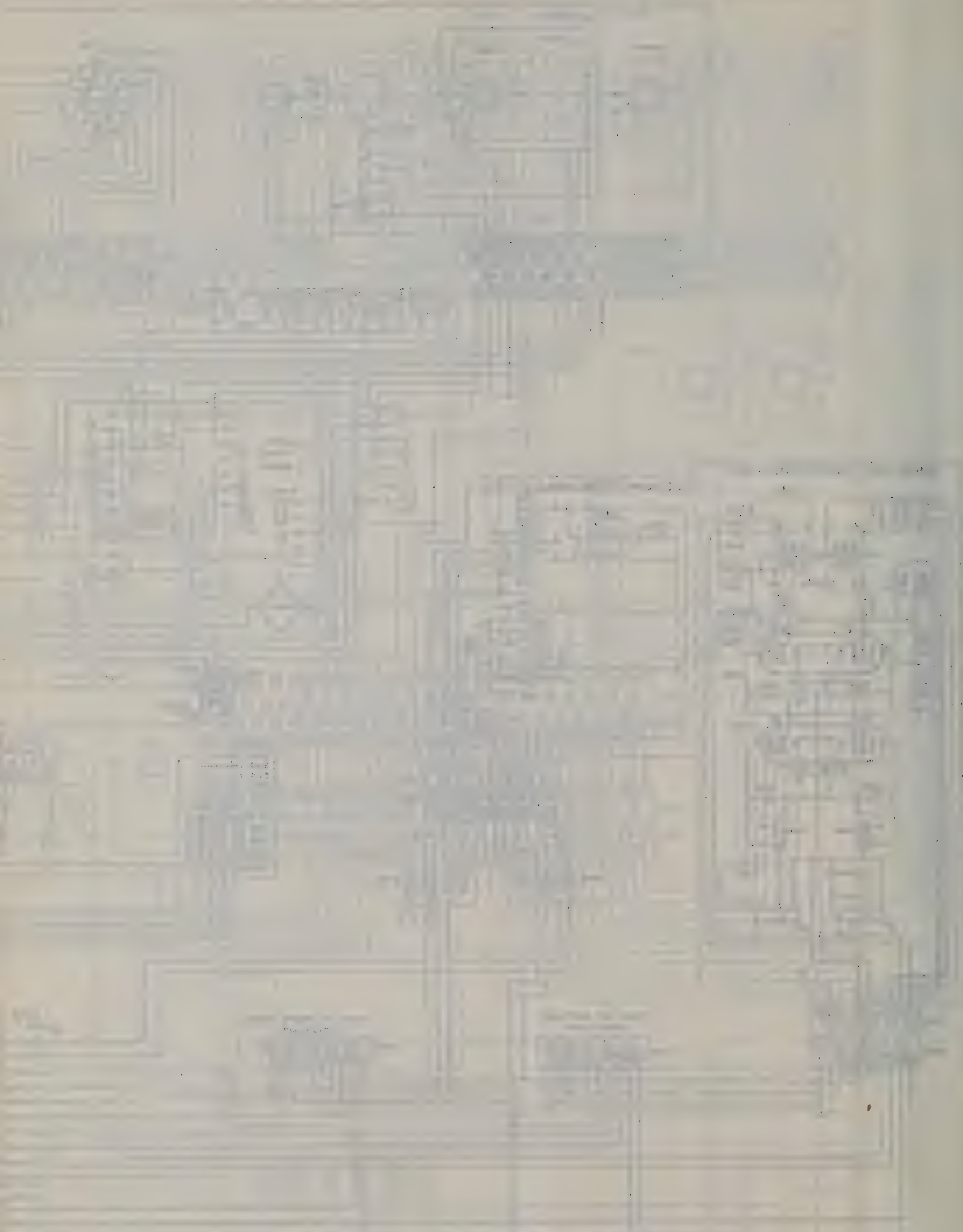


Figure 247. Radio Transmitter T-454/FRT-26, Preset Tuning Control Circuits, Cabling Schematic Diagram.



NOTE:
1. —θ— INDICATES FLEXABLE SLEEVE INSULATION.
2. ALL UNMARKED WIRE IS #18 BUS.





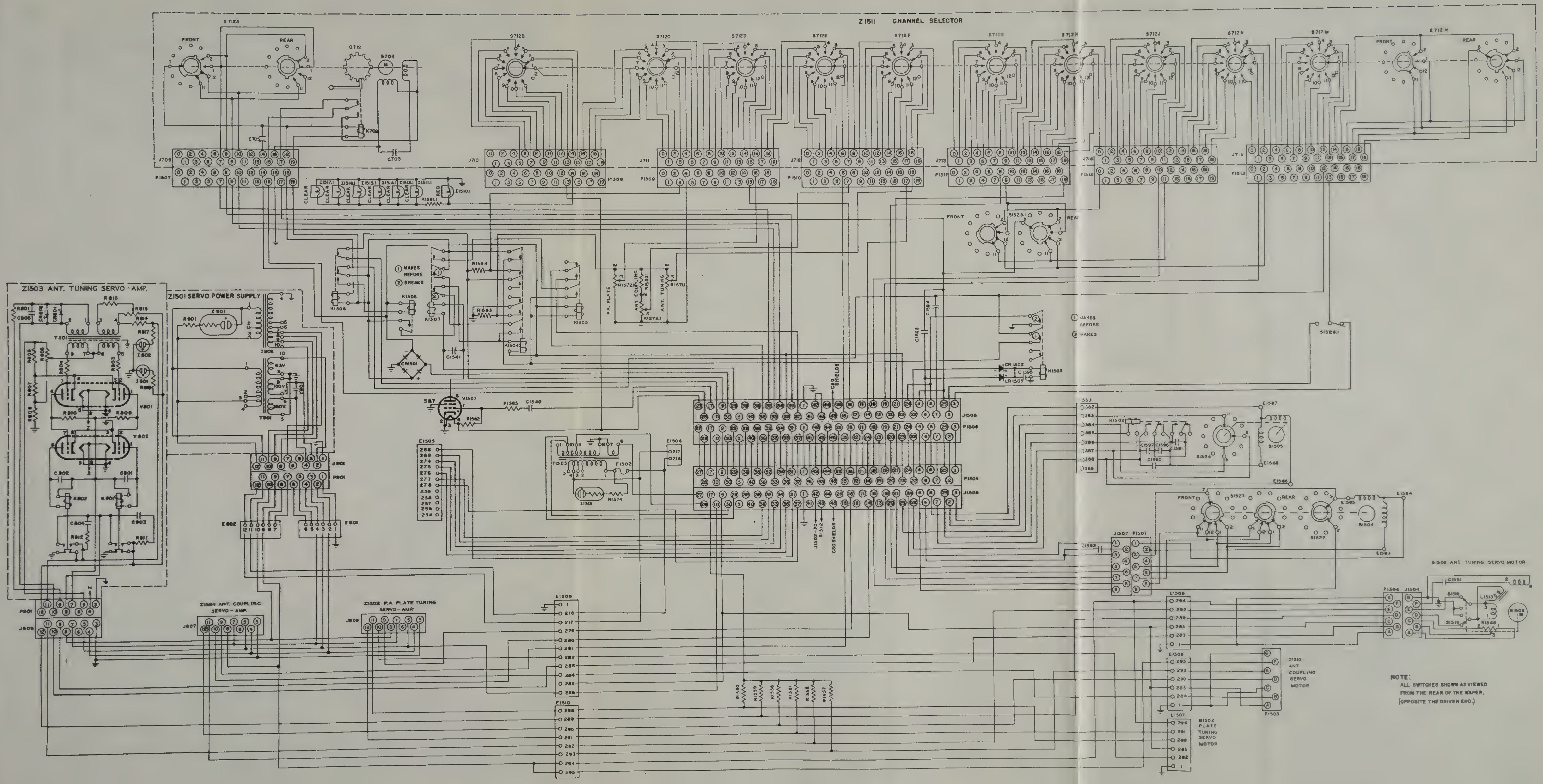
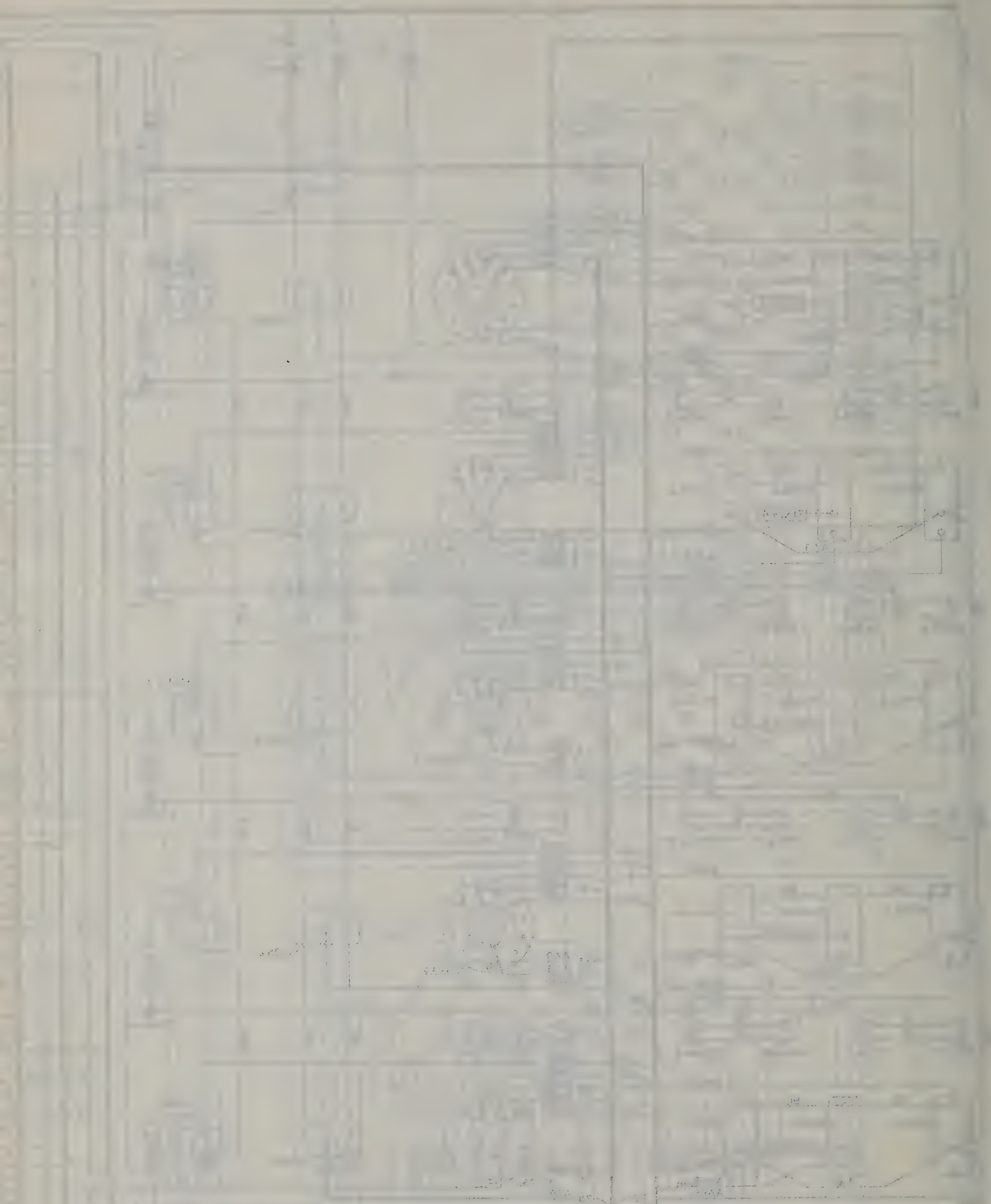
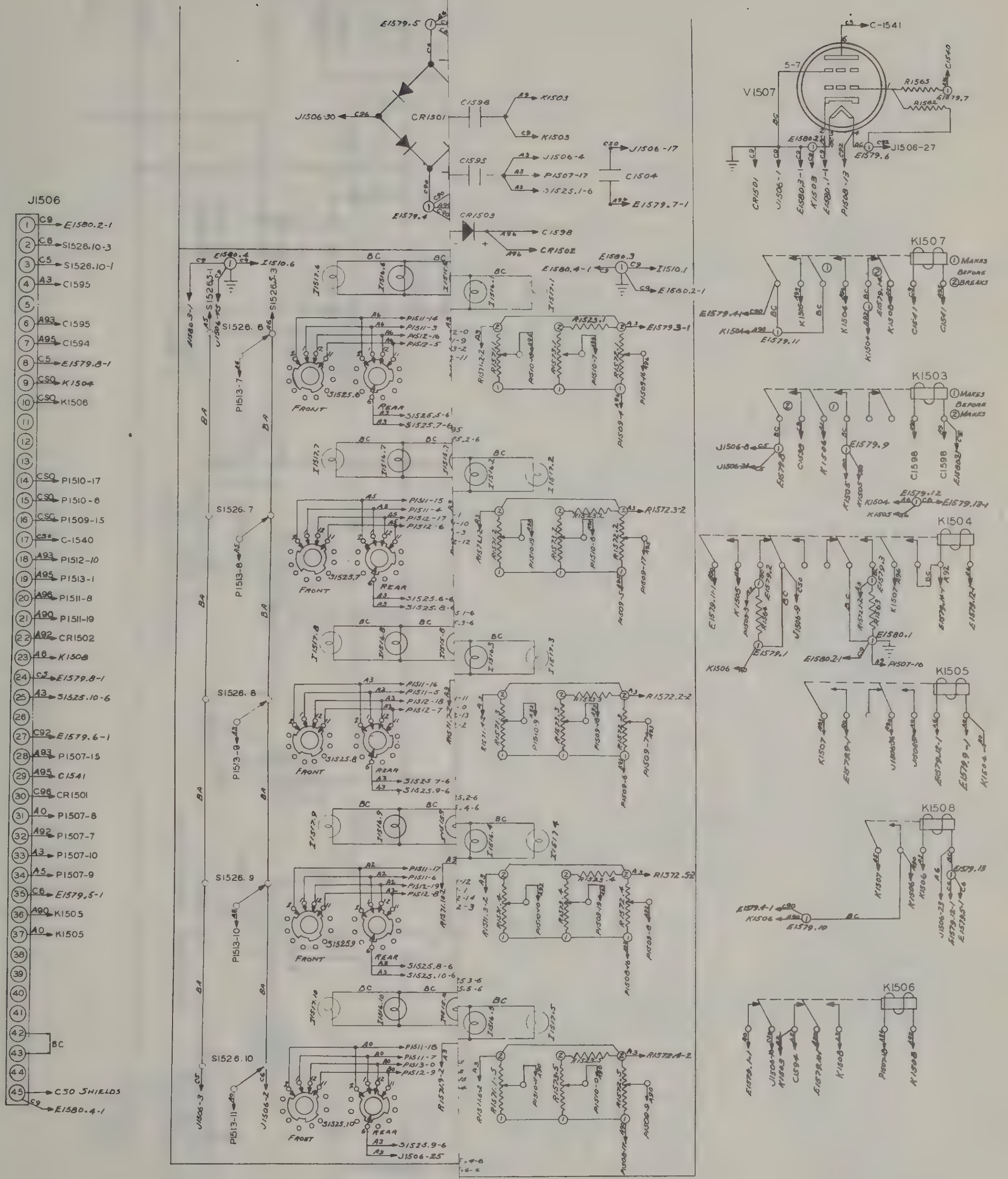


Figure 248. R-F Amplifier AM-738/FRT-22, Preset Tuning Control Circuits, Complete Schematic Diagram.




J1506
V1507
K1507
K1503
K1504
K1505
K1508
K1506
FRONT
REAR

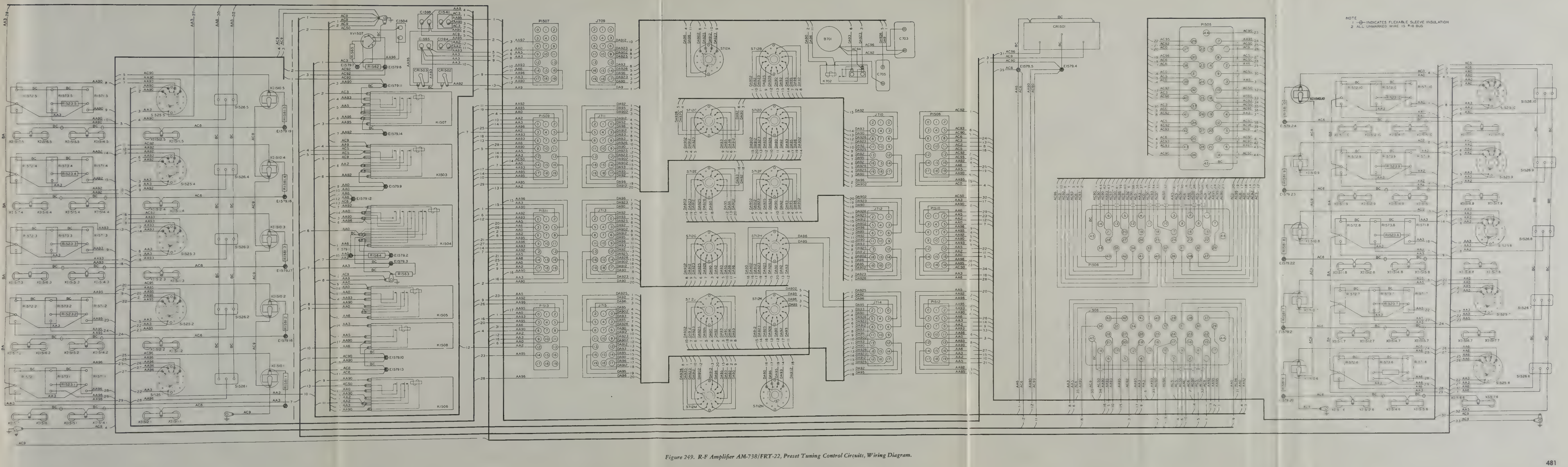


Figure 249. R-F Amplifier AM-738/FRT-22, Preset Tuning Control Circuits, Wiring Diagram.

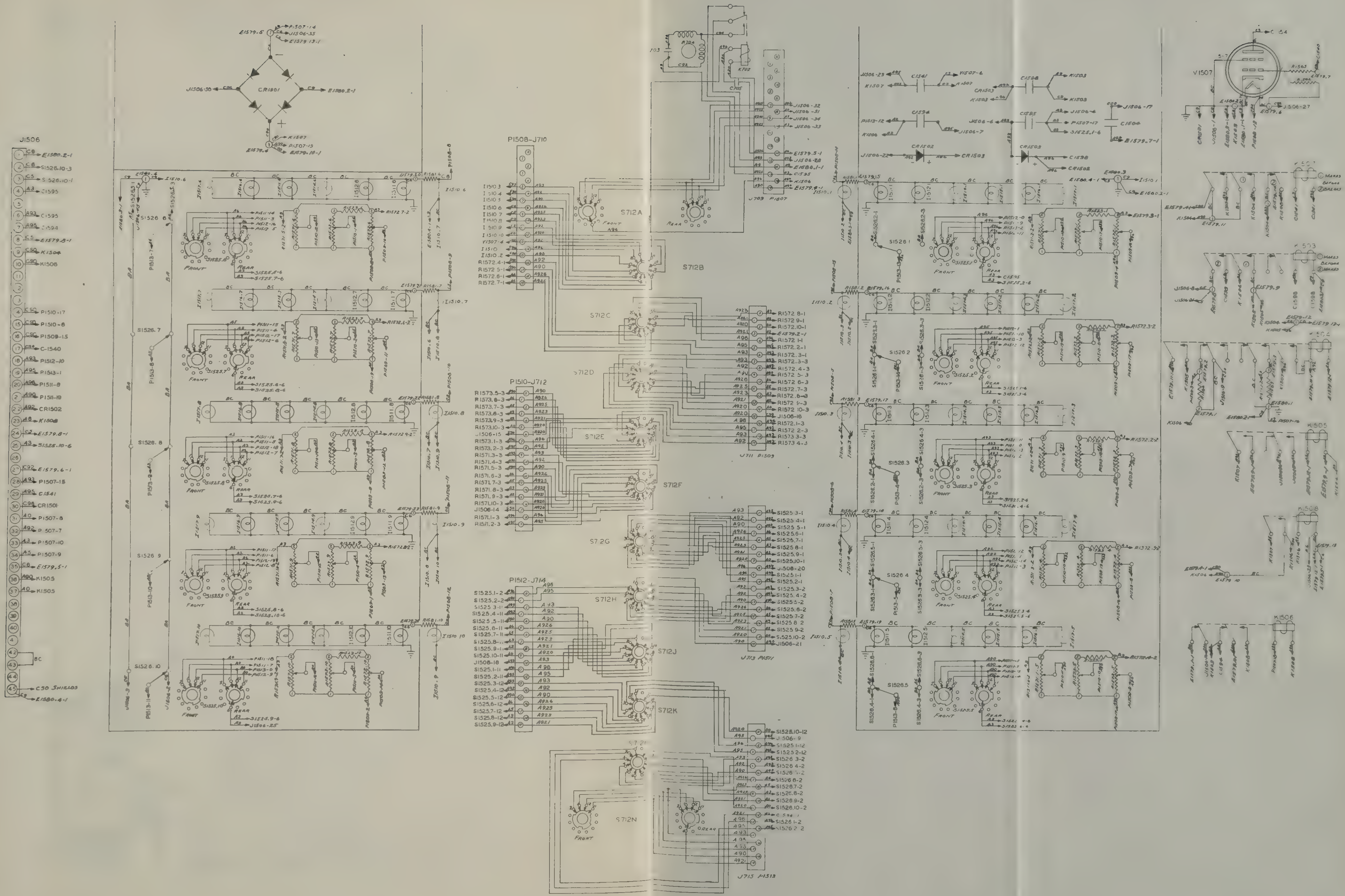


Figure 250. R-F Amplifier AM-738/FRT-22, Preset Tuning Control Circuits, Cabling Schematic Diagram.

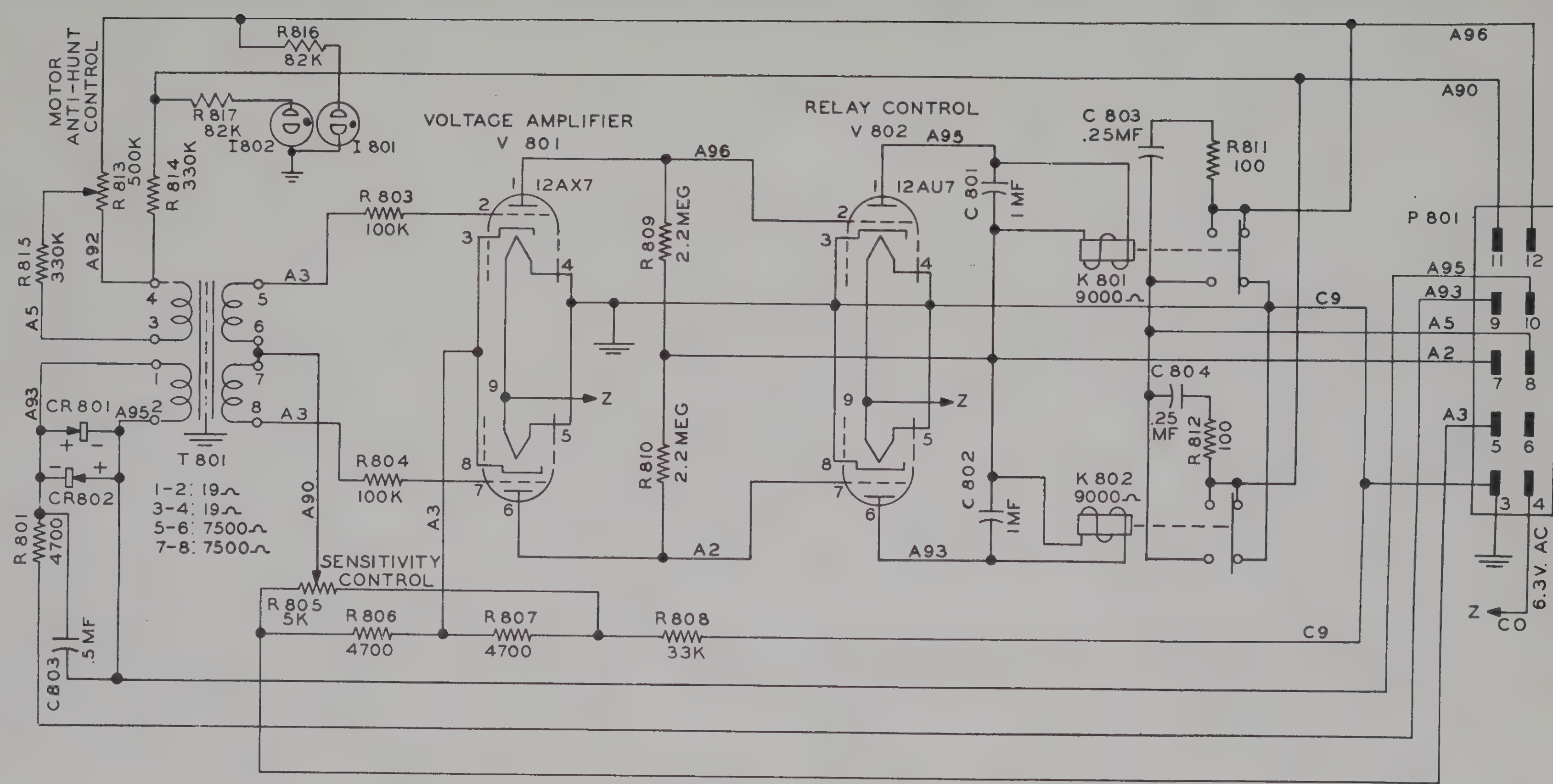
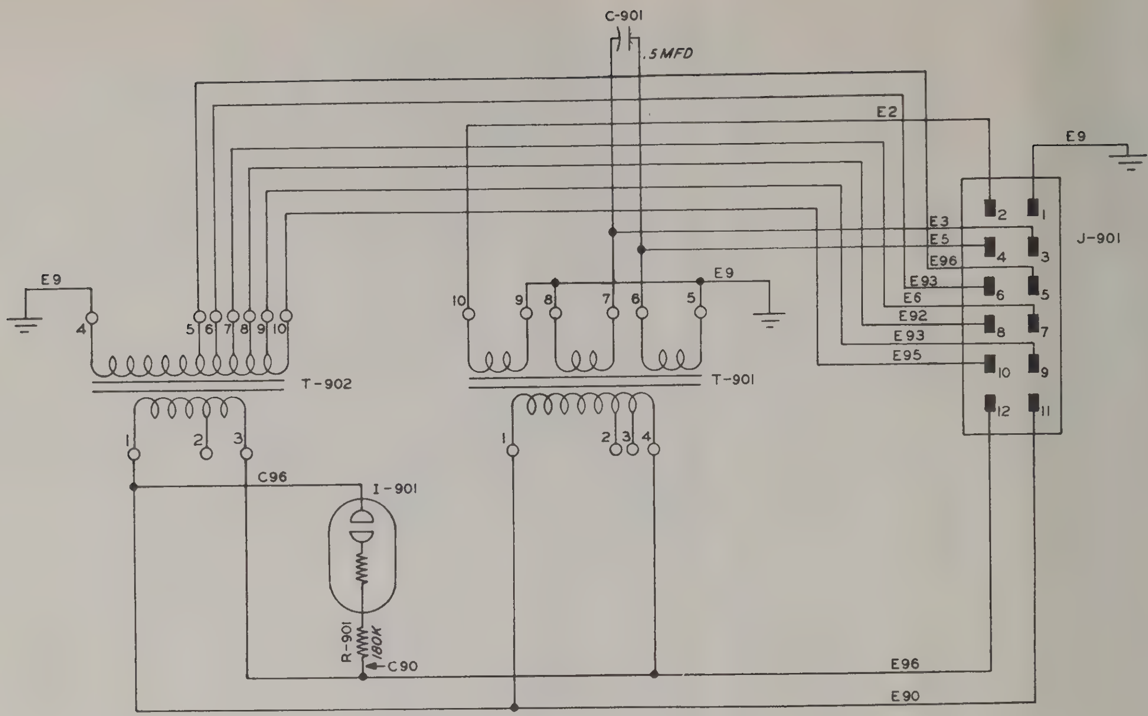


Figure 251. Servo Amplifier, Complete Schematic Diagram.



T-901		T-902	
1-2	215 VAC	1-2	208 VAC
1-3	230 VAC	1-3	230 VAC
1-4	245 VAC	4-5	50 VAC
5-6	250 VAC	4-6	65 VAC
7-8	100 VAC	4-7	80 VAC
9-10	6.3 VAC	4-8	100 VAC
		4-9	115 VAC
		4-10	130 VAC

Figure 252. Servo Power Supply, Complete Schematic Diagram.

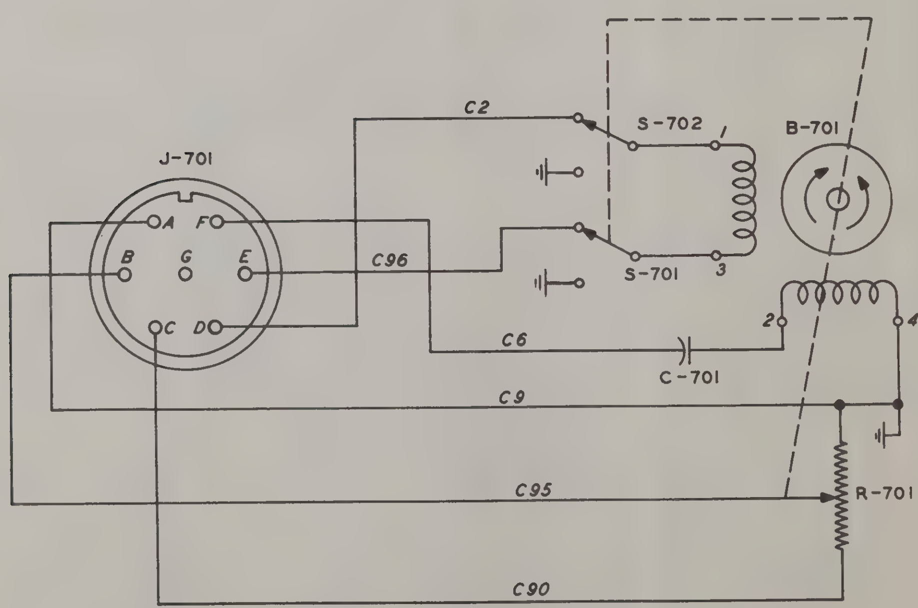


Figure 253. Servo Drive Units Z-507, Z-508, Complete Schematic Diagram.

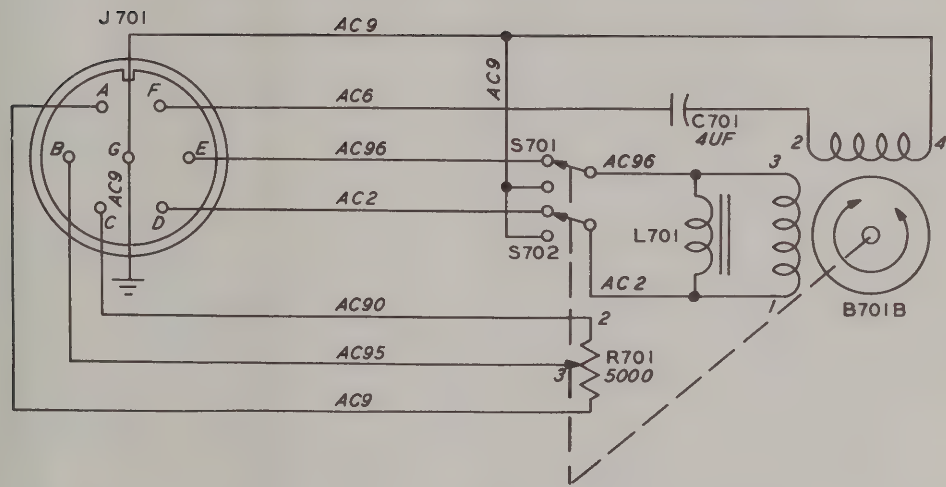
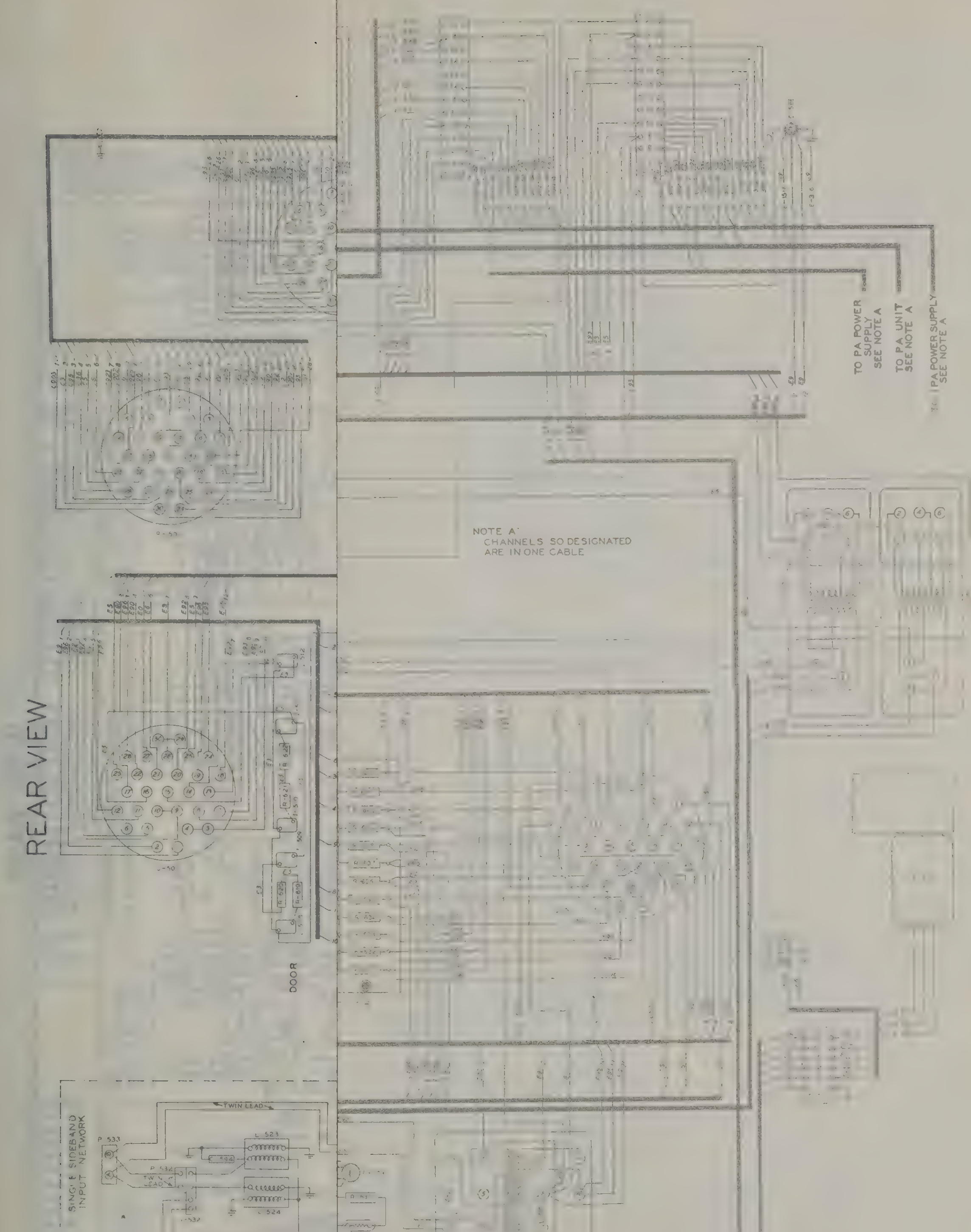


Figure 254. Servo Drive Units Z-509, Z-510, Z-511, Z-1510, Complete Schematic Diagram.


REAR VIEW
NOTE A:
CHANNELS SO DESIGNATED ARE IN ONE CABLE
TO PA POWER SUPPLY SEE NOTE A
TO PA UNIT SEE NOTE A
TO PA POWER SUPPLY SEE NOTE A
DOOR
SINGLE SIDEBAND INPUT NETWORK
TWIN LEAD

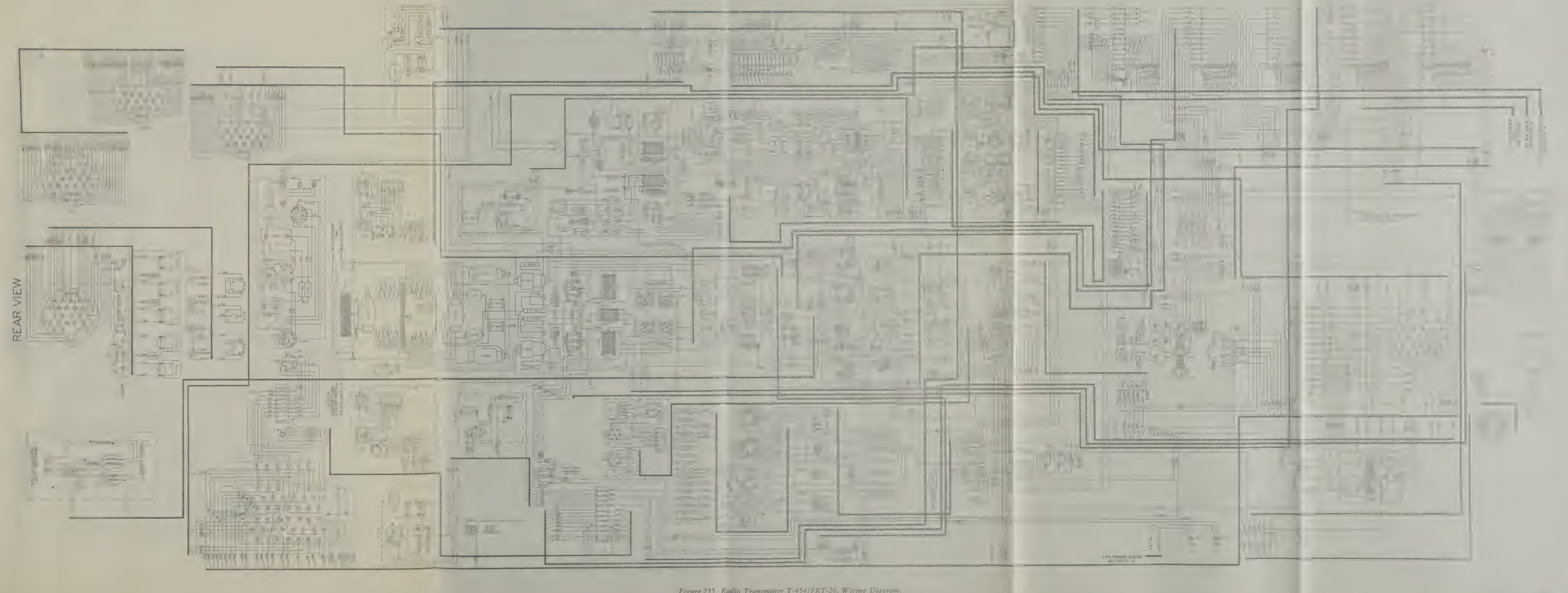
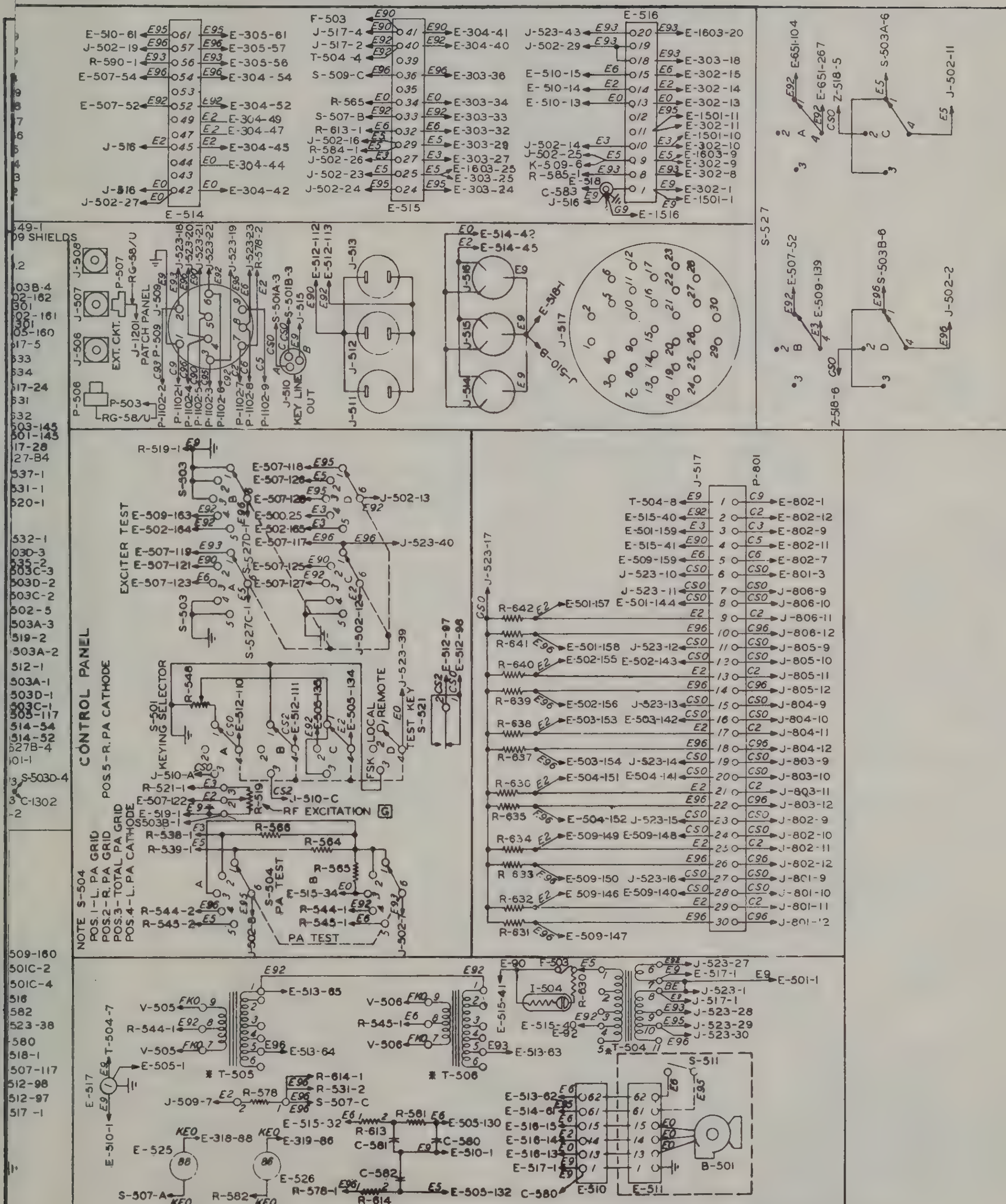


Figure 255. Radio Transmitter T-454/FRT-26, Wiring Diagram.

NOTE: S-503
POS. 1-BUFFER CATHODE
BUFFER & 1ST MULT. GRID
POS. 2-1ST MULT. CATHODE
2ND MULT. GRID
POS. 3-2ND MULT. CATHODE
DRIVER GRID
POS. 4-L. PA GRID RF PEAK
L. PA PLATE RF PEAK
POS. 5-R. PA GRID RF PEAK
R. PA PLATE RF PEAK

REAR VIEW



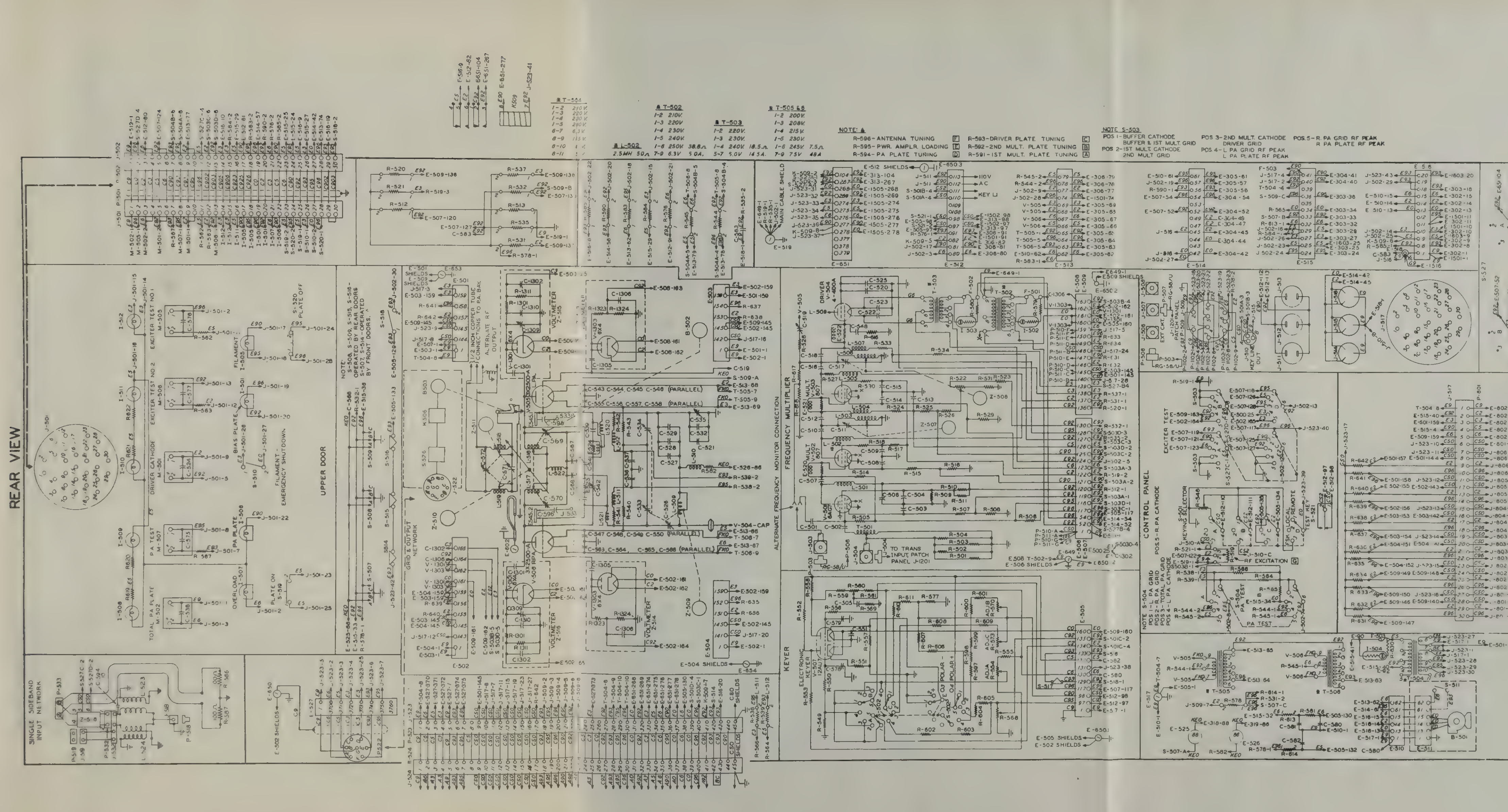
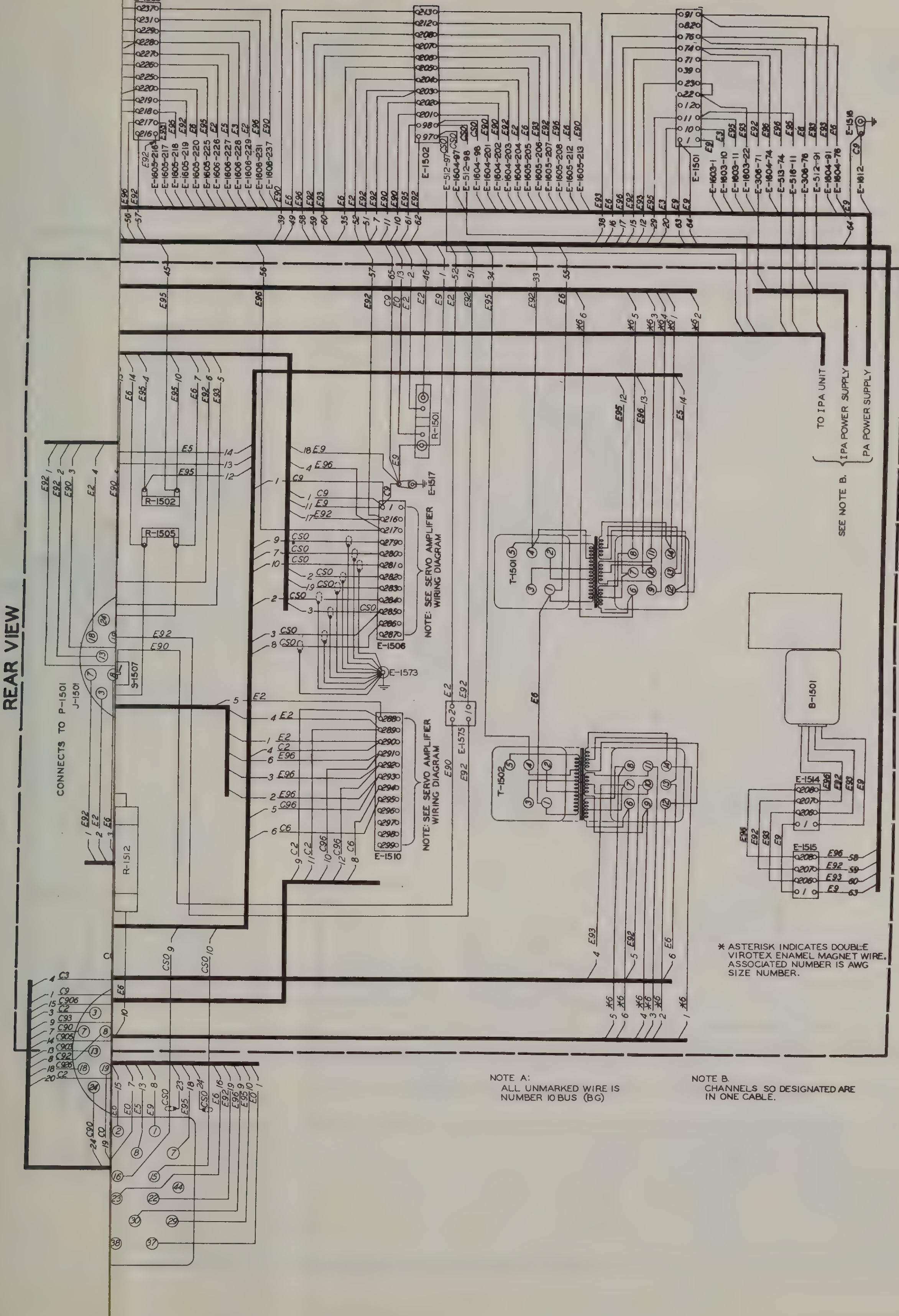


Figure 256. Radio Transmitter T-454/FRT-26, Cabling Schematic Diagram.


REAR VIEW
CONNECTS TO P-1501
J-1501
NOTE: SEE SERVO AMPLIFIER WIRING DIAGRAM
E-1506
E-1510
E-1573
E-1575
T-1501
T-1502
B-1501
E-1514
E-1515
E-1501
E-1502
E-1503
R-1501
R-1502
R-1505
R-1512
S-1507
E-1517
E-1516
TO IPA UNIT
IPA POWER SUPPLY
PA POWER SUPPLY
SEE NOTE B.
* ASTERISK INDICATES DOUBLE VIROTEX ENAMEL MAGNET WIRE. ASSOCIATED NUMBER IS AWG SIZE NUMBER.
NOTE A: ALL UNMARKED WIRE IS NUMBER 10 BUS (BG)
NOTE B. CHANNELS SO DESIGNATED ARE IN ONE CABLE.

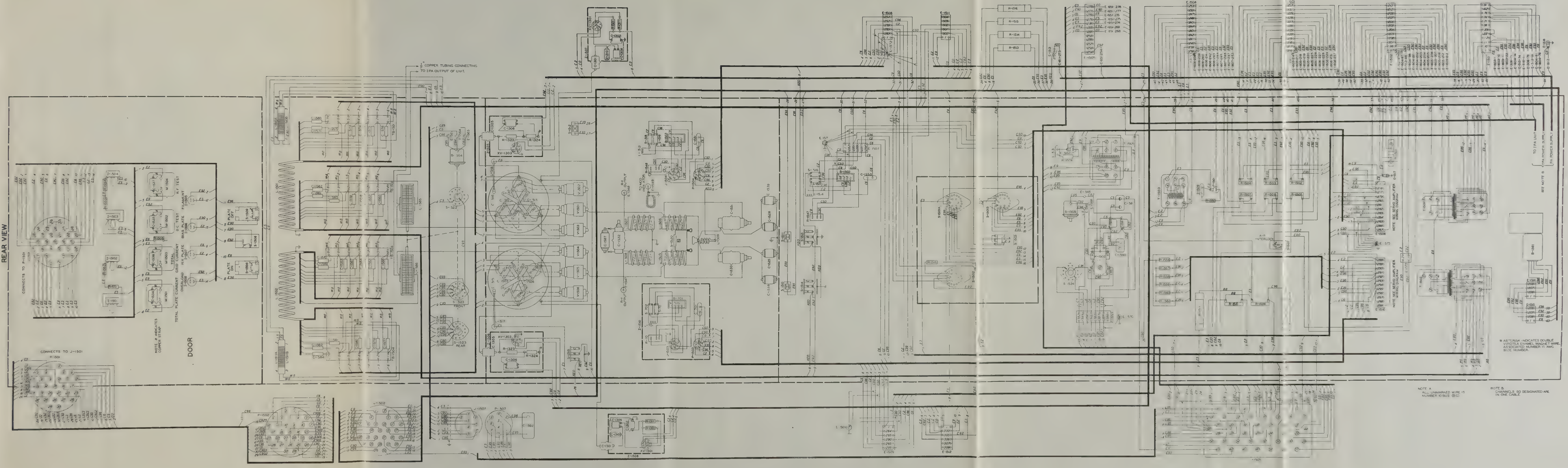
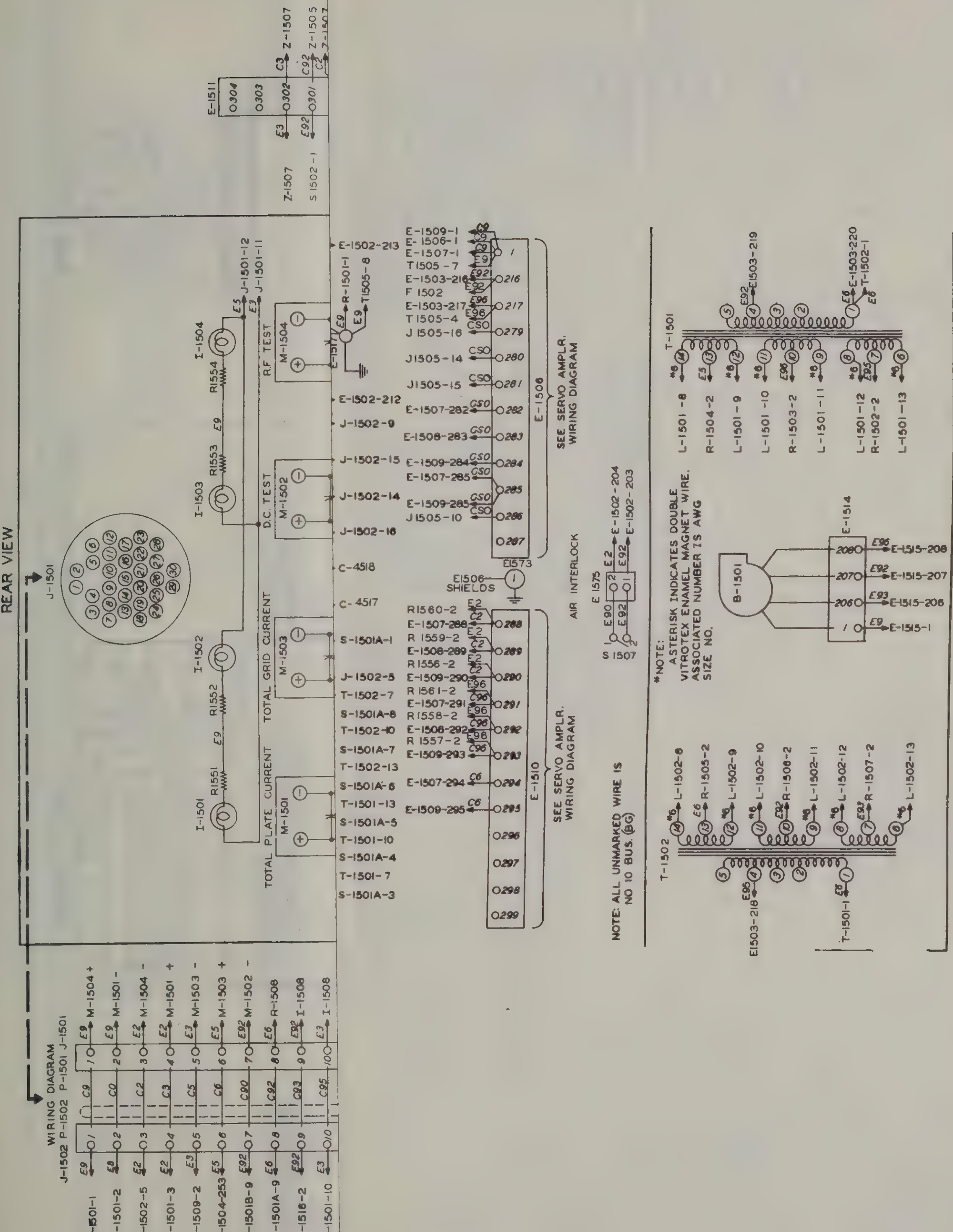


Figure 257. R-F Amplifier AM-' 22. Wiring Diagram.


REAR VIEW
WIRING DIAGRAM
J-1502 P-1502 P-1501 J-1501
J-1501
TOTAL PLATE CURRENT
M-1501
TOTAL GRID CURRENT
M-1503
D.C. TEST
M-1502
R.F TEST
M-1504
SEE SERVO AMPLR. WIRING DIAGRAM
E-1508
E-1510
E1506 SHIELDS
E1573
AIR INTERLOCK
E 1575
S 1507
E-1511
NOTE: ALL UNMARKED WIRE IS NO 10 BUS. (BG)
*NOTE: ASTERISK INDICATES DOUBLE VITROTEX ENAMEL MAGNET WIRE. ASSOCIATED NUMBER IS AWG SIZE NO.
T-1501
T-1502
B-1501
E-1514

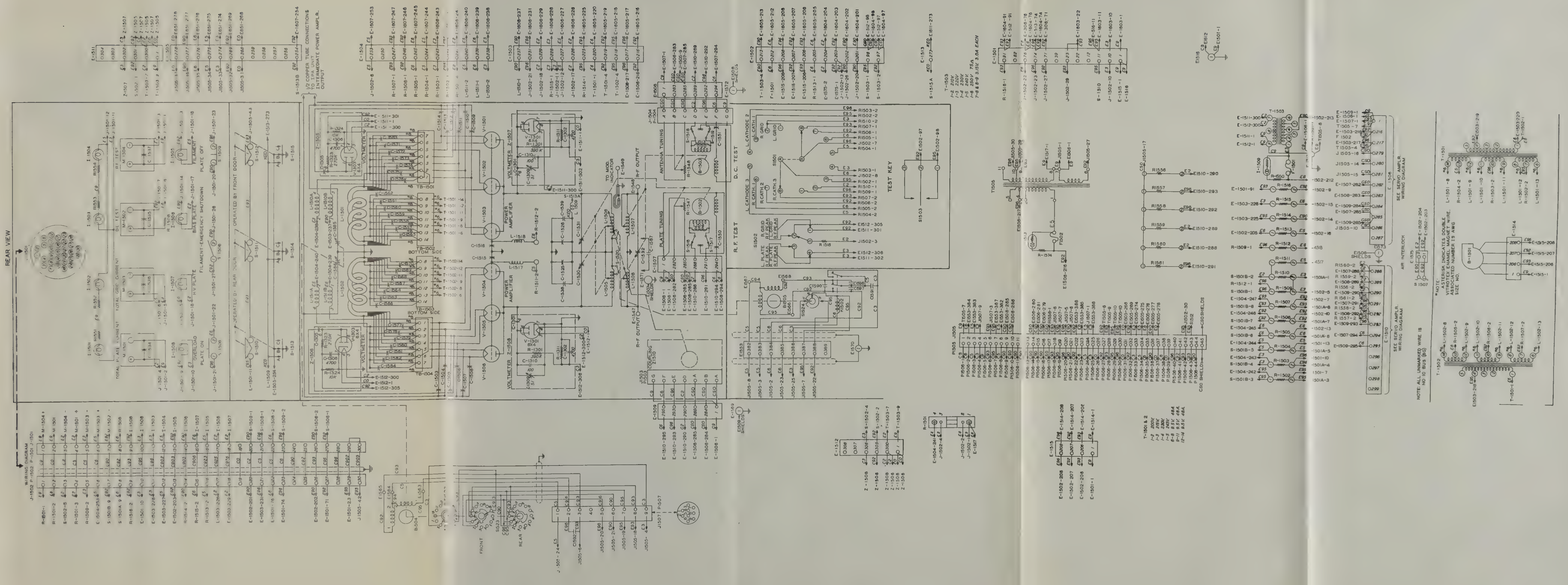
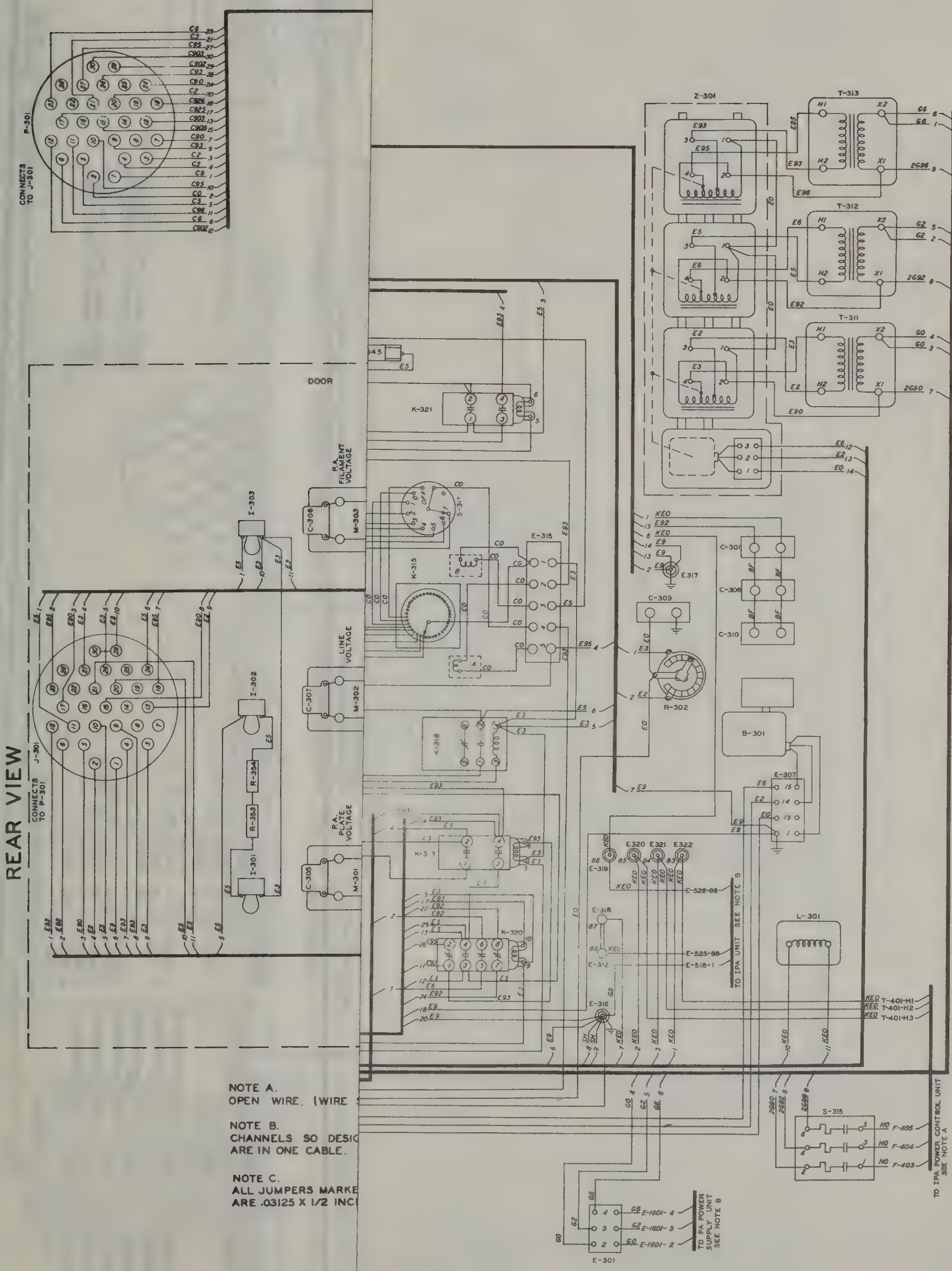


Figure 258. R-F Amplifier AM-738/FRT-22, Cabling Schematic Diagram.



NOTE A.
OPEN WIRE, (WIRE

NOTE B.
CHANNELS SO DESIG
ARE IN ONE CABLE.

NOTE C.
ALL JUMPERS MARKE
ARE .03125 X 1/2 INC

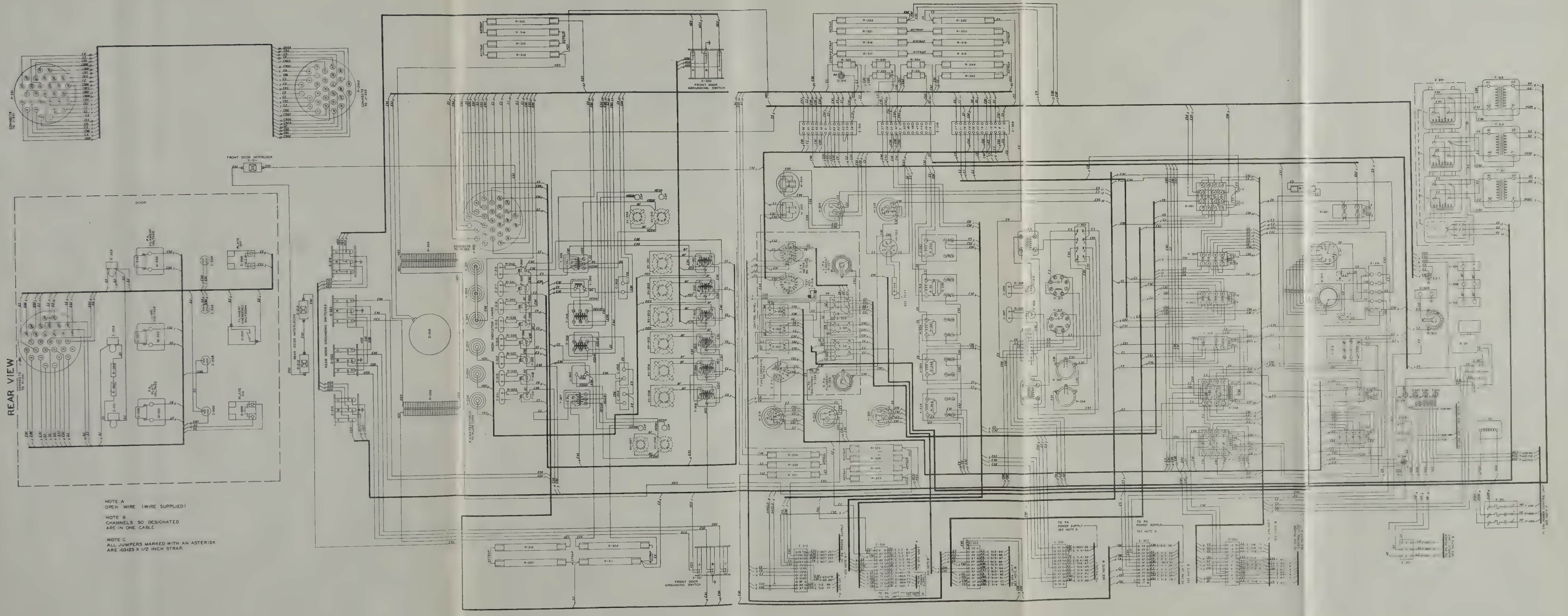
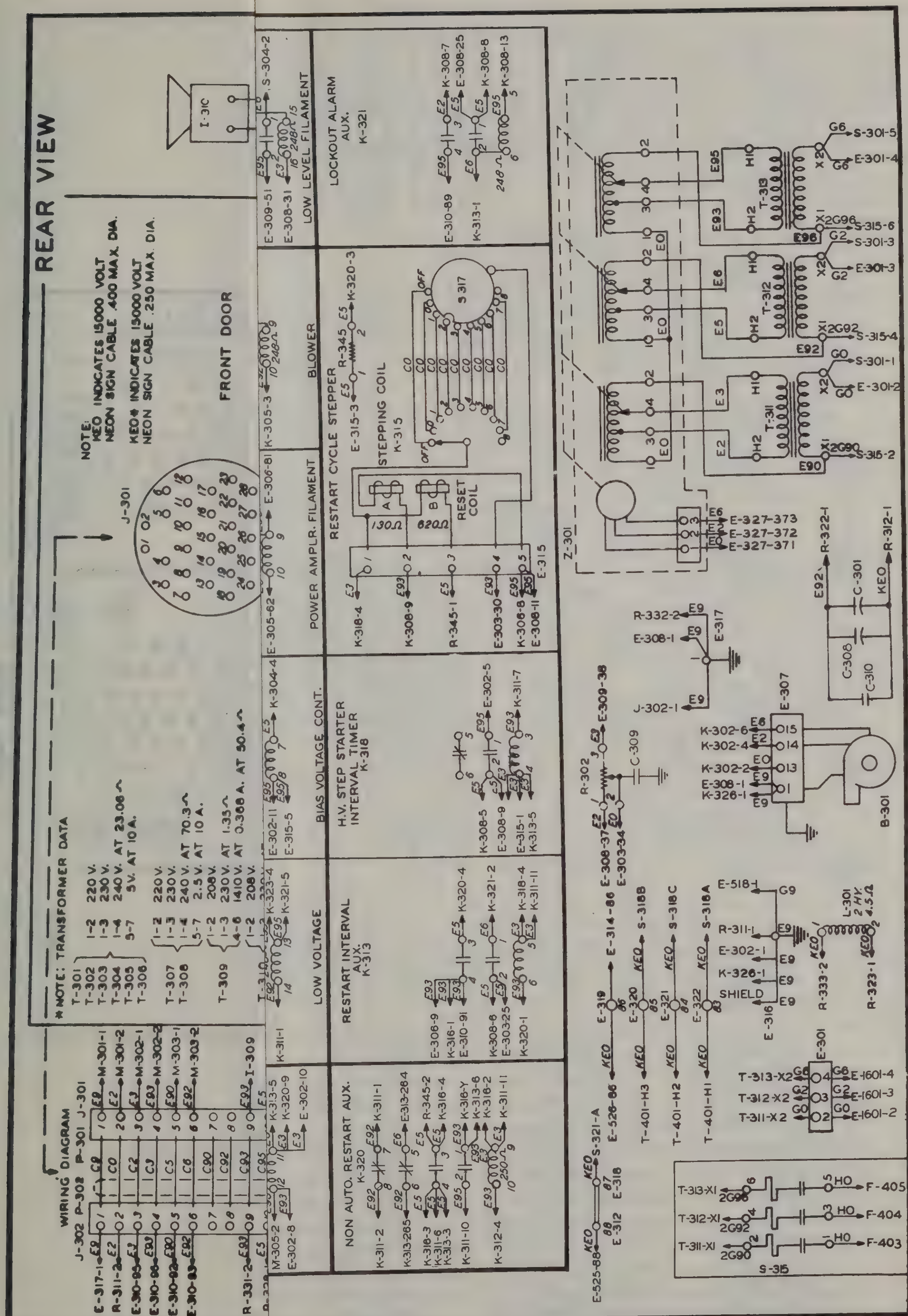


Figure 259. Power Supply Assembly PP-1088/FRT-26, Wiring Diagram.


REAR VIEW
WIRING DIAGRAM
NOTE:
KEO INDICATES 15000 VOLT NEON SIGN CABLE .400 MAX. DIA.
KEO# INDICATES 15000 VOLT NEON SIGN CABLE .250 MAX. DIA.
FRONT DOOR
* NOTE: TRANSFORMER DATA
T-301 T-302 T-303 T-304 T-305 T-306 1-2 220 V. 1-3 230 V. 1-4 240 V. AT 23.06 ∧ 5-7 5V. AT 10 A.
T-307 T-308 1-2 220 V. 1-3 230 V. 1-4 240 V. AT 70.3 ∧ 5-7 2.5 V. AT 10 A.
T-309 1-2 208 V. 1-3 230 V. AT 1.35 ∧ 4-6 1410 V. AT 0.366 A.
T-310 1-2 208 V. 220 V. AT 30.4 ∧
J-301
LOW LEVEL FILAMENT
LOCKOUT ALARM AUX. K-321
BLOWER
RESTART CYCLE STEPPER
STEPPING COIL K-315
RESET COIL
S 317
POWER AMPLR. FILAMENT
BIAS VOLTAGE CONT.
H.V. STEP STARTER INTERVAL TIMER K-318
LOW VOLTAGE
RESTART INTERVAL AUX. K-313
NON AUTO. RESTART AUX. K-320
Z-301
T-311
T-312
T-313
C-301
C-308
C-310
C-309
R-302
E-307
B-301
L-301 2 HY. 4.5 Ω
SHIELD
E-301
S-315

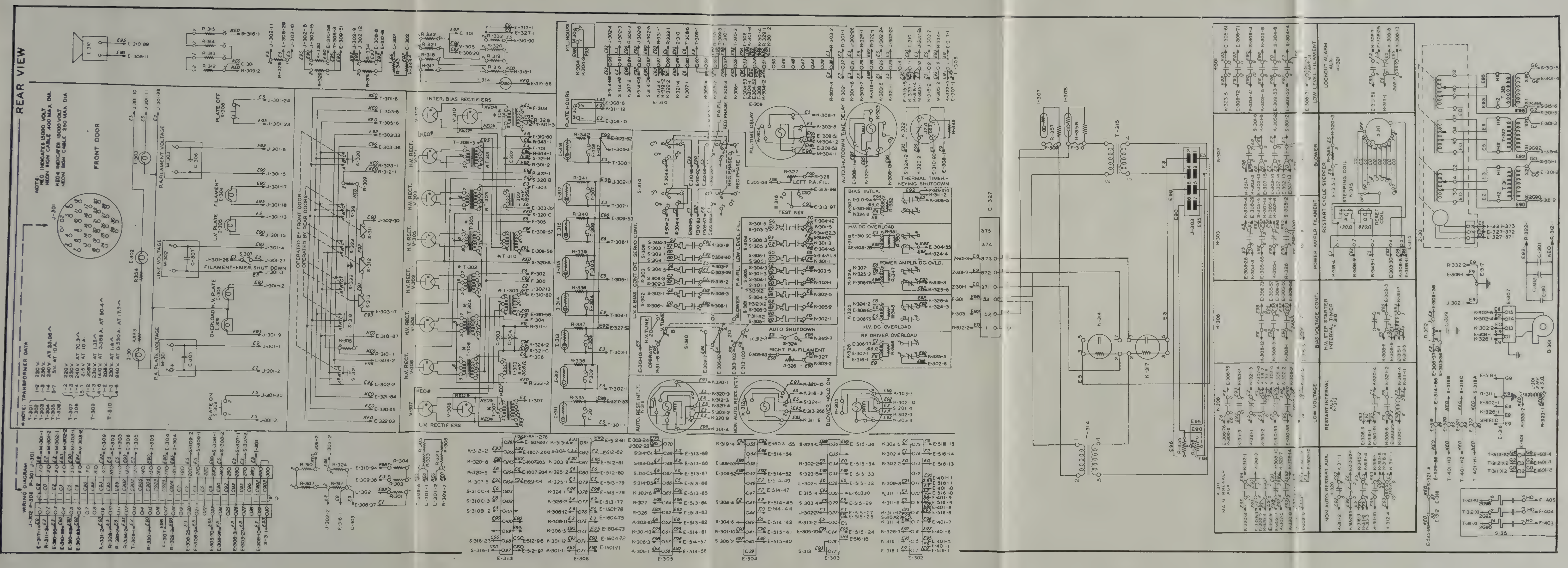
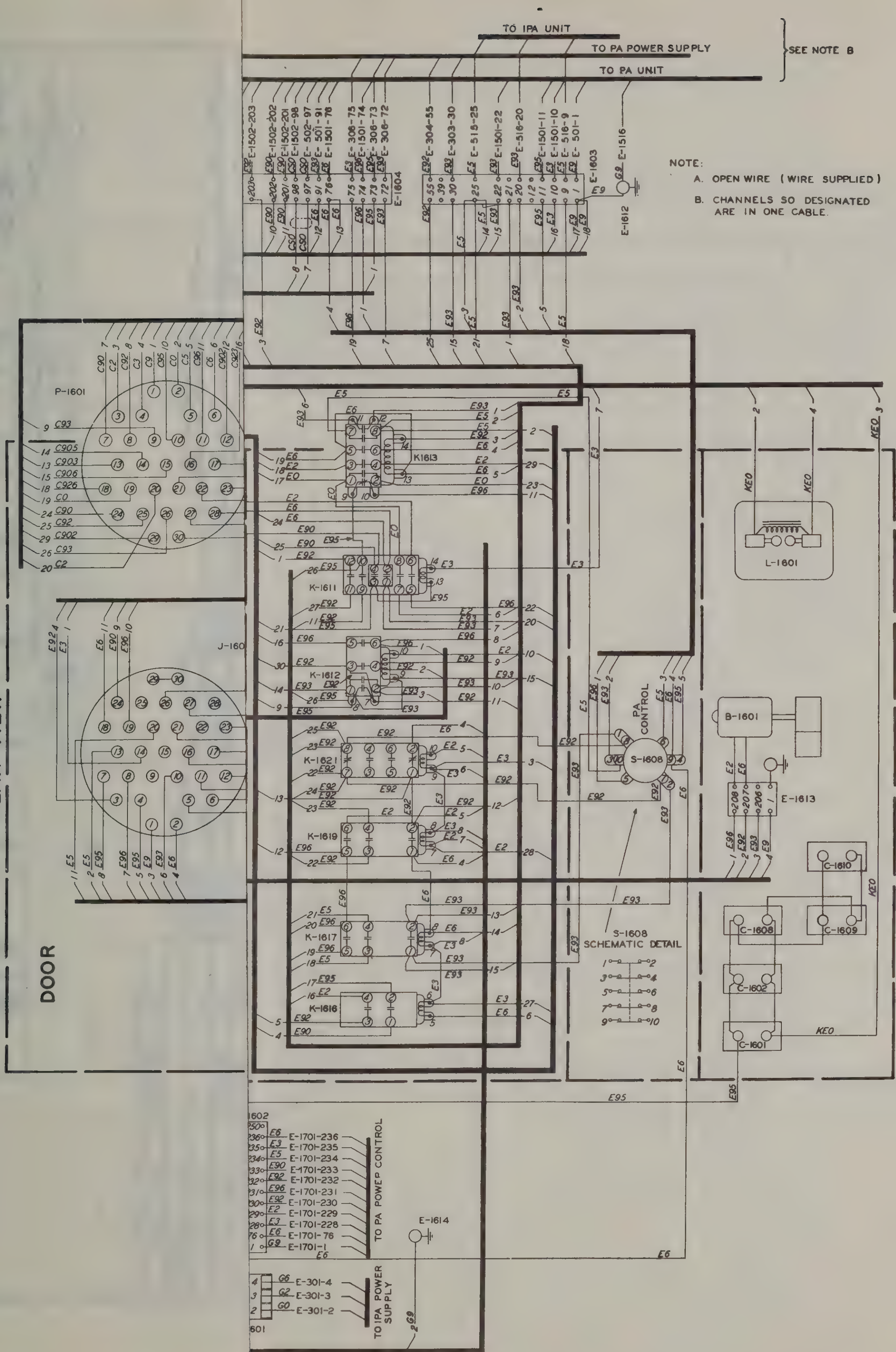


Figure 260. Power Supply Assembly PP-1088/FRT-26, Cabling Schematic Diagram.


TO IPA UNIT
TO PA POWER SUPPLY
TO PA UNIT
SEE NOTE B
NOTE:
A. OPEN WIRE (WIRE SUPPLIED)
B. CHANNELS SO DESIGNATED ARE IN ONE CABLE.
E-1604
E-1603
E-1612
P-1601
J-160
K1613
K-1611
K-1612
K-1621
K-1619
K-1617
K-1616
L-1601
B-1601
E-1613
PA CONTROL
S-1608
S-1608 SCHEMATIC DETAIL
C-1610
C-1608
C-1609
C-1602
C-1601
REAR VIEW
DOOR
TO PA POWER CONTROL
E-1614
TO IPA POWER SUPPLY

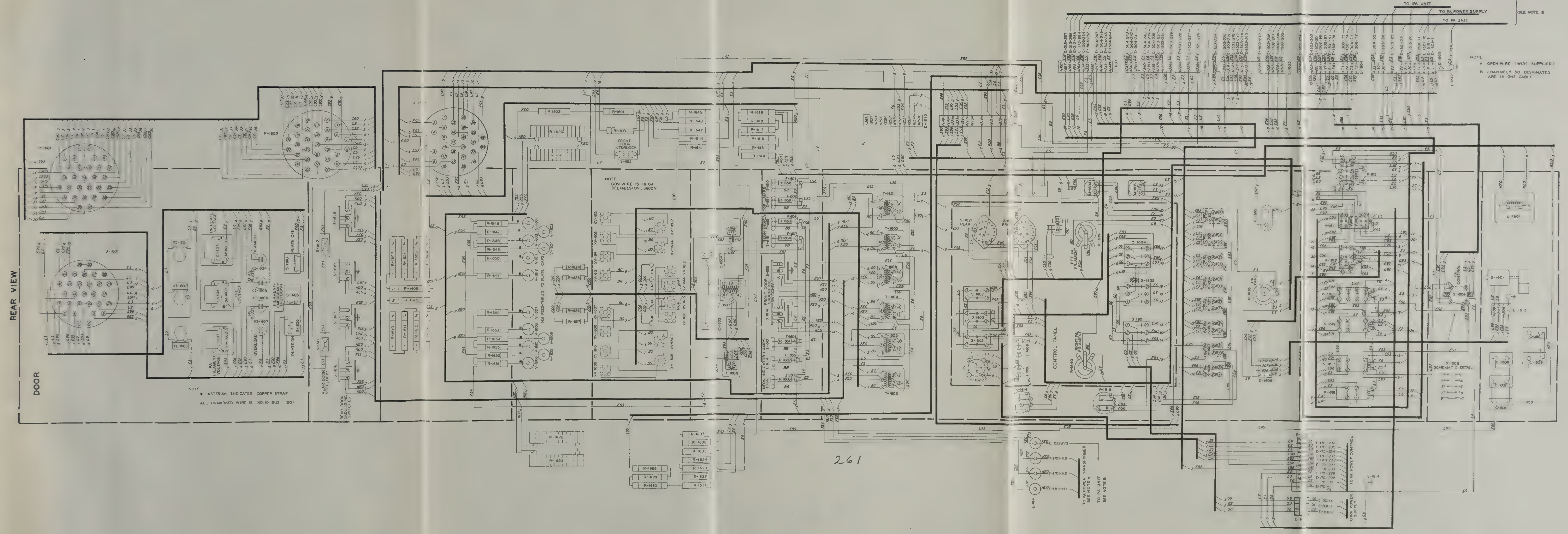
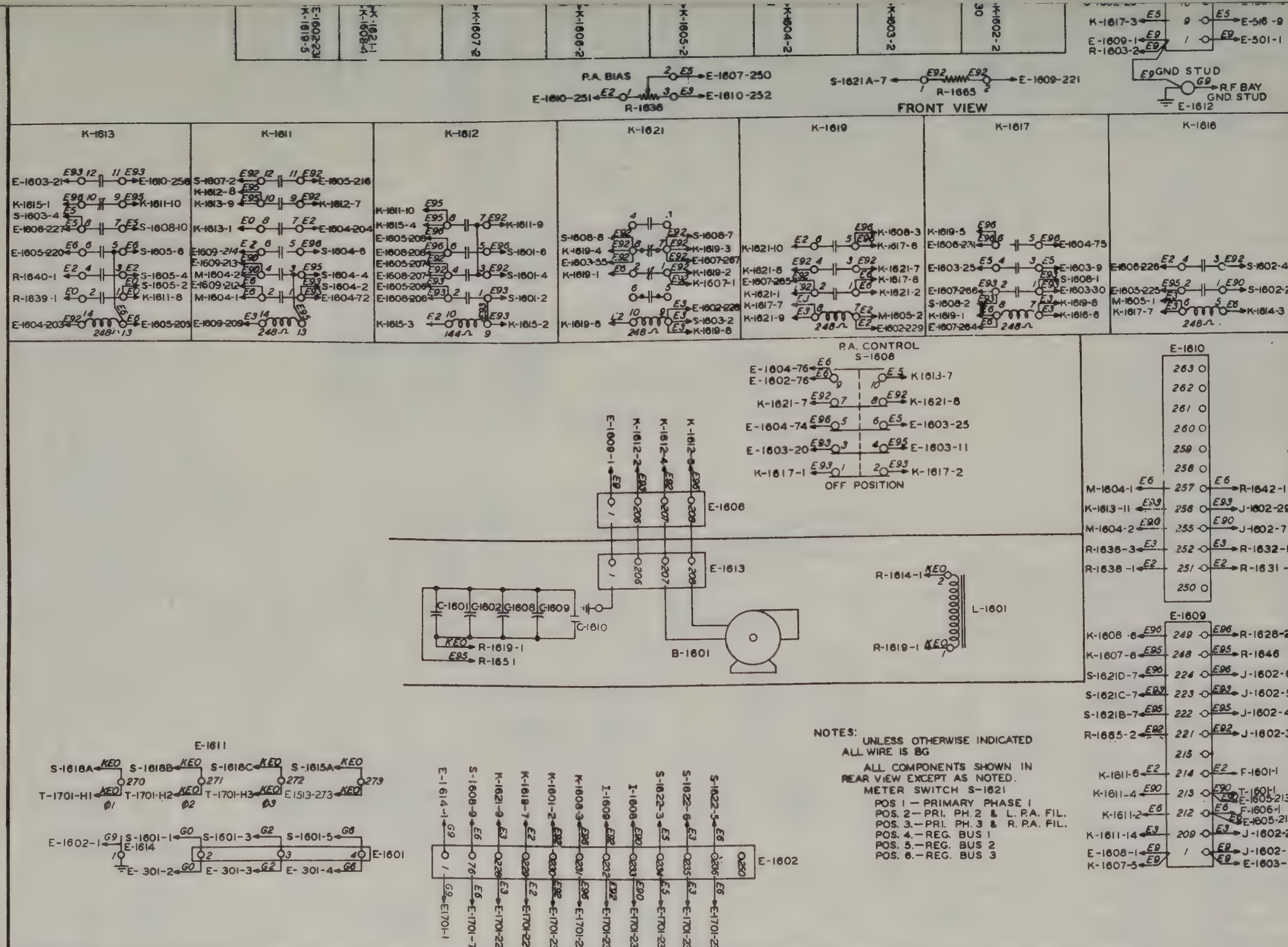


Figure 261. Power Supply Assembly PP-1089/FRT-22, Wiring Diagram.


FRONT VIEW
P.A. BIAS
P.A. CONTROL S-1608
OFF POSITION
NOTES: UNLESS OTHERWISE INDICATED ALL WIRE IS BG
ALL COMPONENTS SHOWN IN REAR VIEW EXCEPT AS NOTED.
METER SWITCH S-1621
POS 1 – PRIMARY PHASE 1
POS. 2 – PRI. PH. 2 & L. P.A. FIL.
POS. 3 – PRI. PH. 3 & R. P.A. FIL.
POS. 4 – REG. BUS 1
POS. 5 – REG. BUS 2
POS. 6 – REG. BUS 3

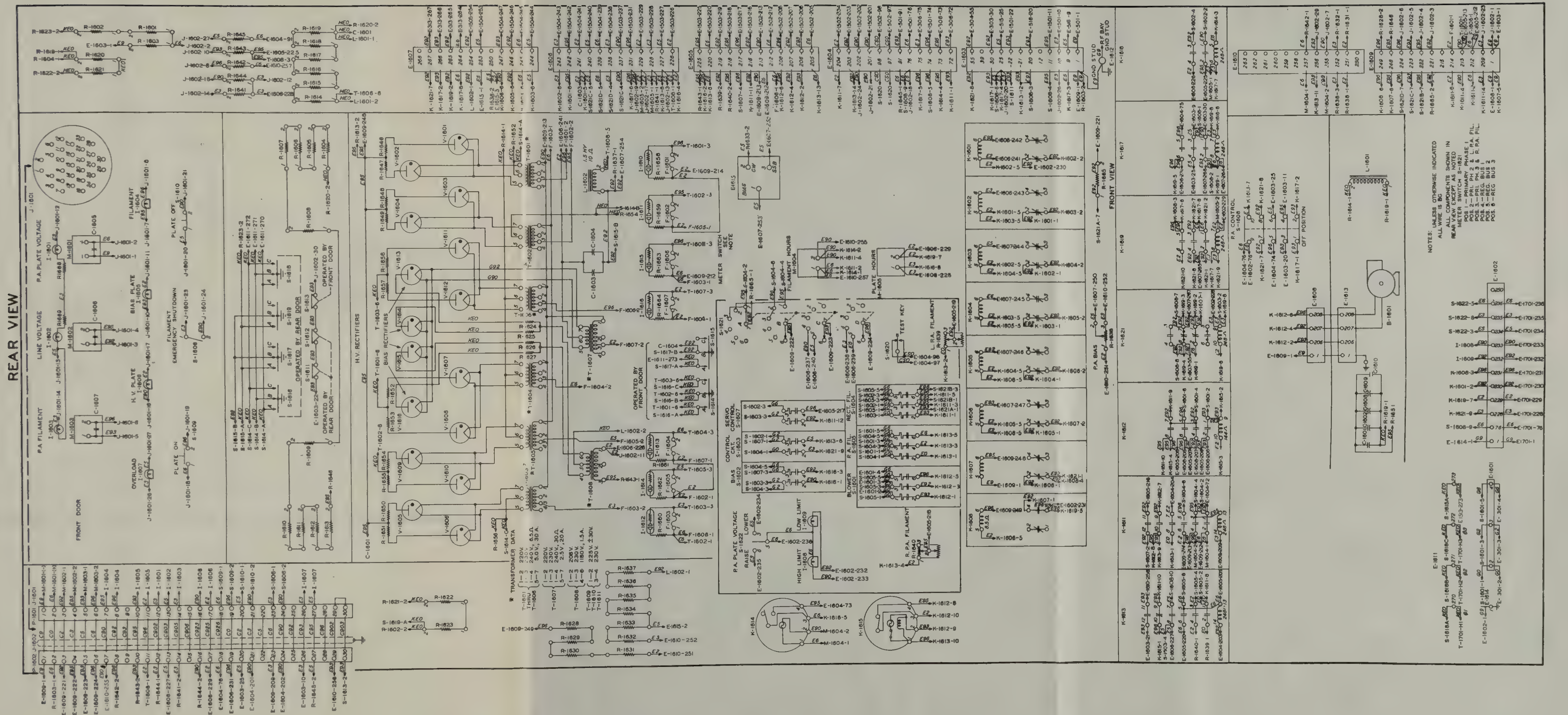


Figure 262. Power Supply Assembly PP-1089/FRT-22, Cabling Schematic Diagram.

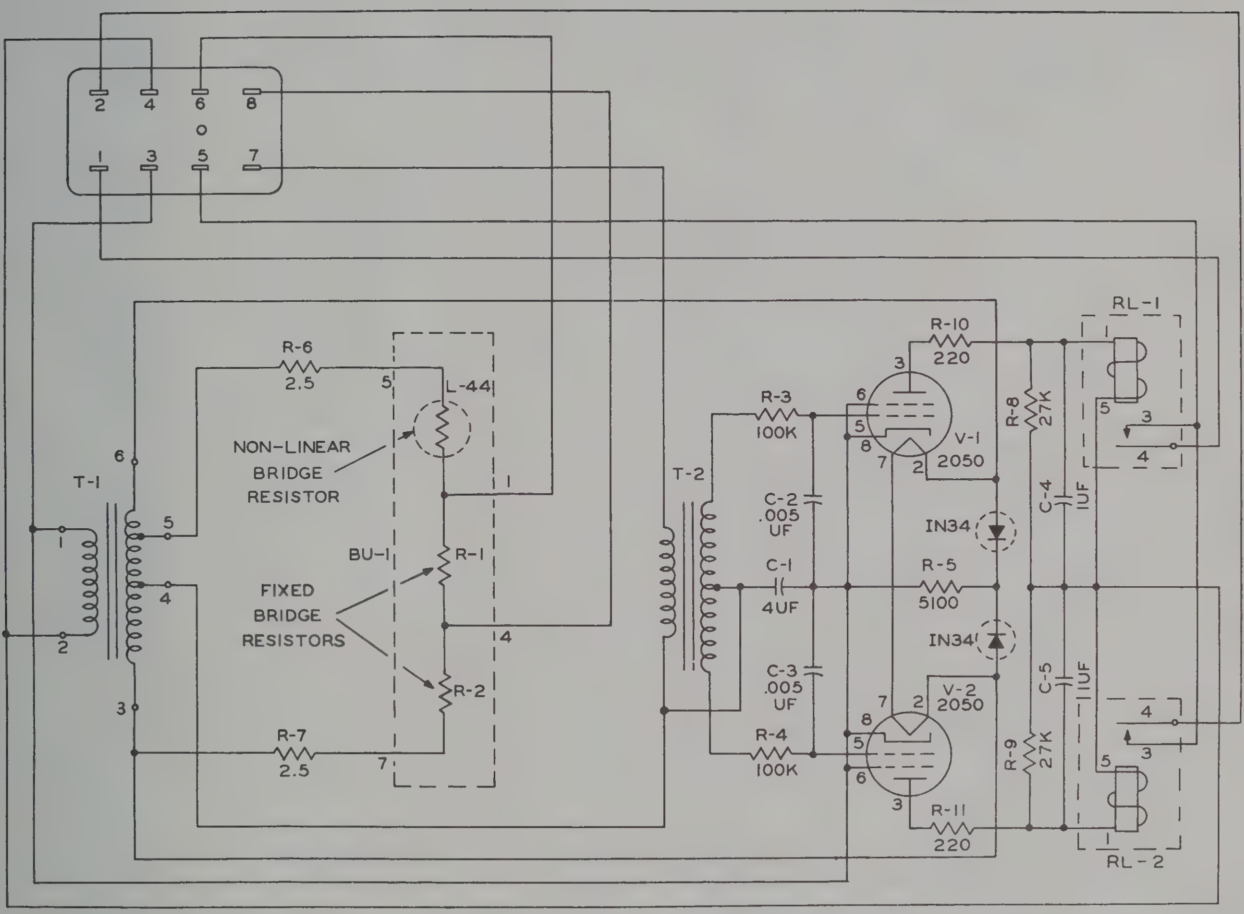


Figure 263. Power Supply Assembly PP-1088/FRT-26, Thyratron Control Unit, Complete Schematic Diagram.

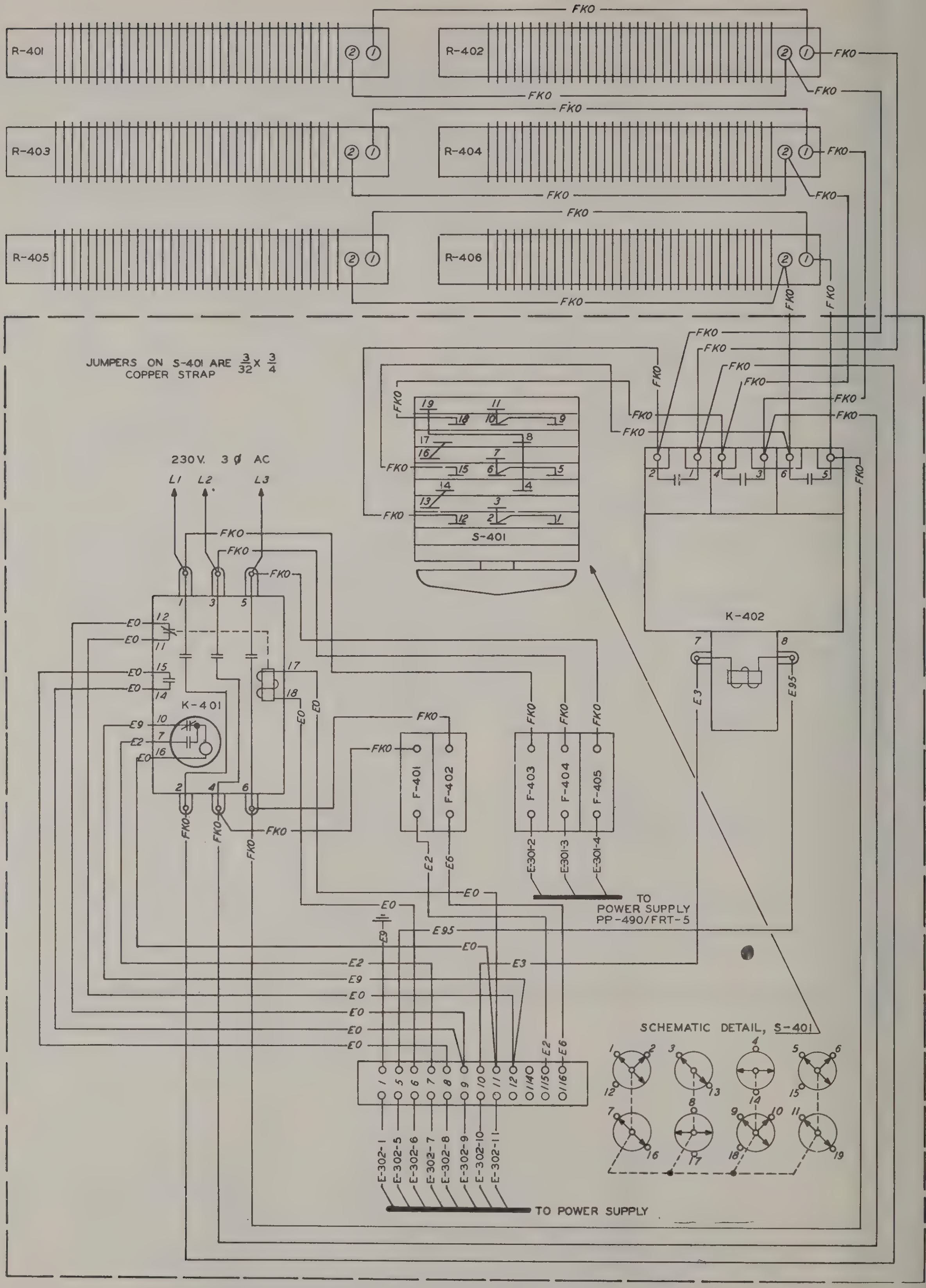


Figure 264. Power Supply Control C-1402/FRT-26, Wiring Diagram.

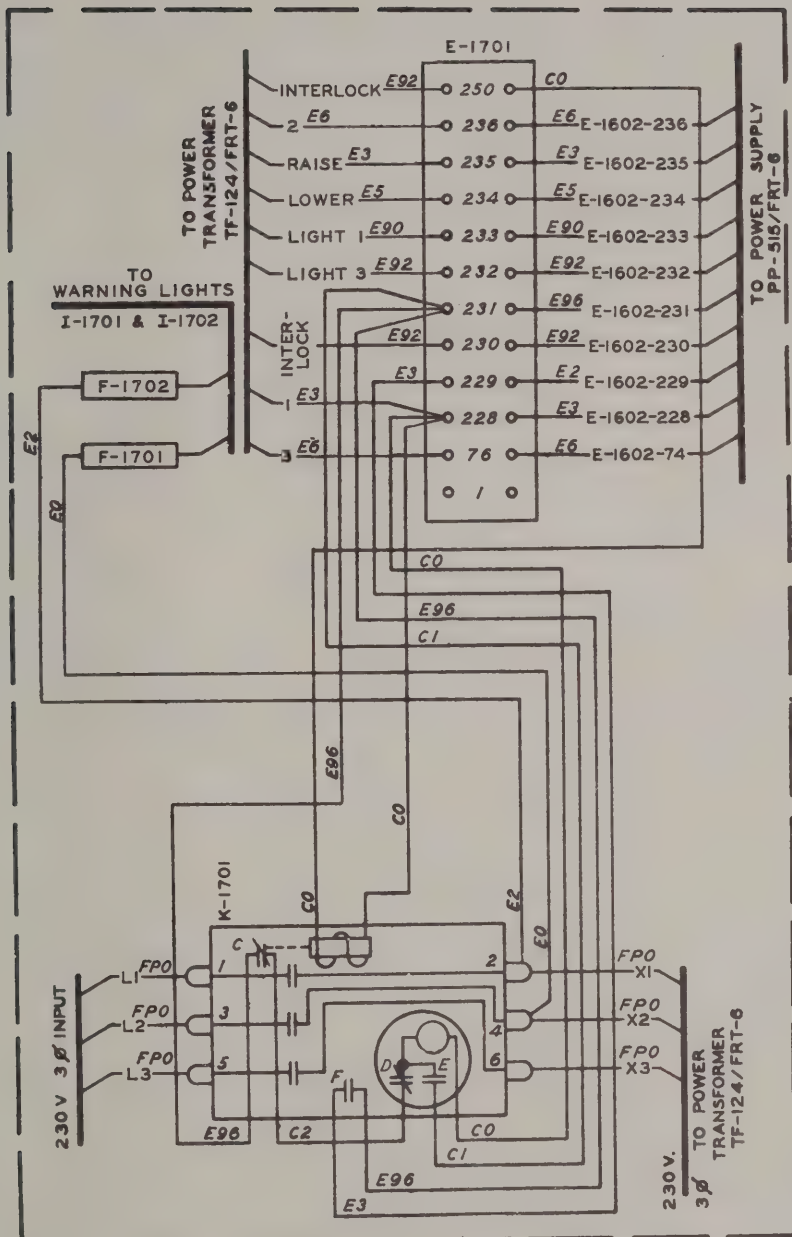


Figure 265. Power Control C-598/FRT-6, Wiring Diagram.

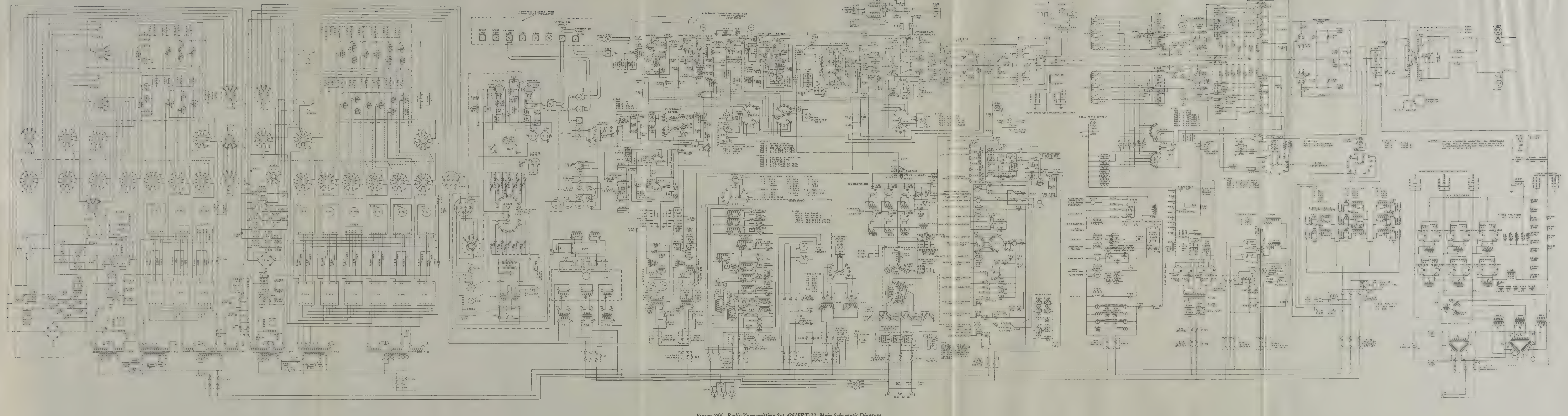


Figure 266. Radio Transmitting Set AN/FRT-22, Main Schematic Diagram.